Representing Classical Artefacts Online:
A User-Centric Approach for an Academic Audience

by

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Abstract

This thesis addresses the suitability of current museum websites for supporting the research activities of academic scholars. Over the past few decades, cultural heritage institutions have increasingly made their collections available online, but longstanding issues with the completeness and consistency of their records have resulted in resources of questionable usefulness. In addition, the museum studies community has chronically ignored scholars as a user group worthy of consideration, and there is thus no existing information on what this population expects and needs from digital collections. Focusing on doctorate holders who study Classical antiquities, this research demonstrates how significant academics are as an audience of the websites created by these organizations, and examines what information and functionality the group requires from these resources in contrast with what museums are actually providing. An online survey of twenty-five faculty members at seven major Canadian universities was conducted to provide a preliminary model of an ideal online collection. Based on this theoretical prototype, the websites of ten North American museums were then assessed to determine how well they are meeting the needs of scholars. The results of both studies were used to devise a set of recommended areas on which new digital collections should focus, and which existing resources should prioritize for improvement. Some of the key problems uncovered include the quantity, detail, and consistency of metadata, the number and content of photographs, the limited options for locating and identifying objects of interest, and the poor provisions for comparing artefacts. This research is limited in scope and addresses only a small portion of a large issue, but the results offer a foundation on which future studies might build.

Preface

This thesis is an original work by Sarah Vela. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "Assessing the Information Needs and Information-Seeking Behaviour of Academic Researchers When Using Digital Records of Classical Antiquities", No. 39198, 5/27/2013.

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Table of Contents

Tables

Figures

Introduction

Since the creation of the World Wide Web in the early 1990s, museums have been striving to expand beyond their physical space by offering information and resources online. The process has been fraught with issues, most of them the result of longstanding practices, and many museums still have little more than a flyer for current exhibits on their websites, but a growing number now provide access to a digital catalogue of their collections. As has been noted by Cameron, however, "the rate that museum data have been brought online has not been reciprocated by the critical evaluation of the actual significance or utility of the data".[1] In essence, although records are being made available on museum websites, the information and system designs do not take into account the actual needs of users. While this is true in respect to all audiences, it is particularly the case for scholars, who have been largely disregarded by the museum studies community. There has been little research conducted on the requirements of this group when accessing museum websites, and thus no information exists on whether the digital resources of these institutions are adequate to serve an academic audience, or how they might be improved in this regard. The research presented in this thesis begins to address this issue by examining the expectations of scholar who use museum websites within the narrow scope of Canadian doctorate holders and collections of Classical antiquities.

There are two related lines of inquiry behind this investigation. The first examines the information needs and information-seeking behaviour of an academic population to devise a model of what museum websites should ideally contain. It includes such

[1] Fiona Cameron, "Digital Futures II: Museum Collections, Documentation and Shifting Knowledge Paradigms", *Collections: A Journal for Museum and Archive Professionals* 1, no. 3 (2005): 243-259, 244.

questions as which online resources do scholars access for their research and why; how do they locate information on a website; what metadata do they need in artefact records; and are there interface designs that make it easier for this group to locate and interpret information. The second line of inquiry evaluates how well current museum websites are meeting the needs of scholars, as established based on the answers to the questions above, and how they could be improved. In order to answer these queries, two studies were conducted, the first examining scholarly users, and the second evaluating museum websites. Based on the results of both of these studies, the conclusion of this thesis offers a tiered set of recommended areas in which cultural heritage institutions might improve their websites in order to better serve an academic audience.

The structure of the six chapters in this thesis is as follows. Chapter 1 outlines the development of museums from their ancient origins to recent trends. The areas of focus are the historic relationship and eventual separation of scholars and these institutions, the implications of the late nineteenth-century division of libraries and museums into separate organizations, and modern efforts to digitize collection records and make them available online. The present issues with museum websites are the result of principles and practices that go back a century or more, and the information in this chapter thus contextualizes the remainder of the research.

In Chapter 2, the current state of museum studies literature is examined as it relates to online visitors and digital resources designed to serve their needs. The first section compares the volume of research on, and attitude towards, different audiences to demonstrate the disregard in the field for academic users. There is a predominant and still growing focus in museums on meeting the needs of the general public and its subsets

such as children and minorities. The development of tools for curators and other museum staff is a less active, but still sizeable area of study. Scholars, however, have been deemed by museum studies researchers to be indistinguishable from other audiences or too small a group to be considered in system design. The second section argues against the latter position, by examining the results of several studies quantifying and describing visitors to museum websites in order to prove that academic users comprise a significant portion of the online audience for these institutions, and one thus worth considering when creating digital resources.

Chapter 3 outlines the limits and approach of the investigation undertaken in this thesis. The questions underlying the research are explained in more detail, and the scope of the investigation is described and justified. As noted above, this research is limited in terms of scholarly users to doctorate holders and in terms of institutions to collections of Classical antiquities. In addition there are several areas that are not covered, most notably the reasons why many institutions do not include collection records online. This chapter also draws on existing studies in museum studies, library and information studies (LIS) and the digital humanities to define three key concepts in this research: information-seeking behaviour, metadata, and interface design. Finally, the methodologies of data collection and analysis for the two studies conducted are explained. The first is a small online survey of Canadian faculty members who use Classical artefacts in their research, while the second is a rubric-based evaluation of ten North American museum websites.

The results, analyses and conclusions of the user study are presented in Chapter 4. Some of the major findings include that the metadata available in online museum records is not sufficient to support scholarly research, particularly in terms of the images

included, and that participants desired support for both close and distant evaluations in the information retrieval systems and interfaces. There are also concerns among respondents about the quality and reliability of the data provided online by these institutions, and about the design of the websites generally. While the scale of this study is too small to be definitive, the results suggest several trends that are worth investigating in the future, and indicate a significant disconnect between what these users expect from a museum website and what they are actually given.

Chapter 5 similarly relates the results and key findings of the website assessment, the second study completed for this research. The museums included in the evaluation differed widely in their strengths and weaknesses of meeting the needs of scholars, but all had aspects that could be enhanced. Some of the most predominant trends across the websites were extreme intra-institutional inconsistency between records, insufficient photographic documentation of objects, limited information retrieval options, and no capacity for comparing multiple artefacts. There were, however, indications that the museums are aware of these issues and are interested in correcting them in the future. Nonetheless, at this point the data gathered confirms that the online resources provided by cultural heritage institutions do not reflect the expectations of an academic audience and in many cases cannot support scholarly research.

Finally, Chapter 6 offers conclusions based on the results of the studies described above, primarily in the form of recommendations for how museums might improve their websites so that they better serve an academic audience. These suggestions are separated into three tiers based on their primacy and the difficulty of their implementation. The lowest level describes a website requiring minimal technical expertise, but which will

support identifying, if not fully analyzing, artefacts of interest. It also provides a solid foundation for the more advanced features. The second tier builds on this groundwork by recommending enhancements to the metadata and information retrieval options of a website so that most research can be completed digitally. The final level suggests some supplementary additions to website designs that pose significant data gathering or programming challenges, but have the potential to create an online resource that would surpass the research that could be done on a physical trip to a museum. This structure is designed to allow any cultural heritage institution, regardless of the current state of their website, to identify areas in which they should and are able to improve their designs.

The physical objects housed in cultural heritage institutions can be a valuable source of primary data for academic researchers, and the ability to access these artefacts remotely is vital in a world of rising costs and falling funding. The disregard that the museum studies community has for this user group, however, is resulting in websites that do not adequately serve this population. While this issue, which applies to all types of museums and levels of scholars, is too vast to be fully addressed in a single project, the research presented in this thesis increases the field's knowledge of the needs of scholars, and might serve as a foundation for future studies.

Chapter 1 – The Origin and Current State of Museums

The connection between museums and scholars, as well as the state of records for the objects housed in the former, is best demonstrated by relating how these institutions developed. This chapter will summarize the evolution of collections from the creation of the first public museums through the major changes of the nineteenth century that ushered in the modern concept of these organizations. The early relationship of museums and libraries, the causes of their eventual split, and the resulting differences in their progression will be highlighted, as these are the fundamental reasons why the issues with museum records exist. The final section will review several of the recent efforts by researchers in museum studies and the issues that have emerged as a result. The present state of museum websites is a product of longstanding practices, and though there is a growing recognition of the problems there is still significant work to be done.

1.1 The Foundation of Museums

The linguistic origin of the word 'museum' is a Greek term meaning 'of the muses', a reference to the temples celebrating the deities of study and inspiration.[2] The term was also applied to a space in the Palace of Alexandria with "…a public walk and a place furnished with seats, and a large hall, in which the men of learning, who belong to the Museum, take their common meal", though it has been suggested based on this

[2] David Murray, *Museums: Their History and Their Use* (Glasgow: James Maclehose and Sons, 1904), vol. 1, 1; Andrew Erksine, "Culture and Power in Ptolemaic Egypt: The Museum and Library of Alexandria", *Greece and Rome* 42, no. 1 (1995): 38-48, EBSCO (accessed December 9, 2013), 38; George Brown Goode, *Museum-History and Museums of History: A Paper Read Before the American Historical Association, in Washington, D.C., December 26-28, 1888* (New York: The Knickerbocker Press, 1889), Google Books (accessed December 13, 2013), 253-254.

description that the space was closer to a university than a museum in the modern sense.[3] Collections of art, gems and *naturalia* were, however, housed in temples throughout antiquity as documented in written history. Pliny the Elder, for example, relates that after the Roman army defeated a giant snake its "…skin and jaws were preserved in a temple at Rome…", while Pausanias in describing the Athenian Acropolis notes of the *propylaea*[*] that "on the left of the gateway is a building with pictures".[4]

This trend continued in the Middle Ages when churches and monasteries were the repositories for countless relics and artworks "…brought home by pilgrims or travellers".[5] A surviving inventory of the relics held at Glastonbury Abbey during the thirteenth century includes items from over a dozen saints in addition to Christ, the Virgin Mary and the Apostles.[6] Although there was certainly a devotional quality to such objects, with well-known relics attracting pilgrims and worshippers from across Europe, it has been argued that in some abbeys their purpose was equally to inspire "…scholarship and works of hagiography…" among the monks.[7] It is notable for future

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[3] Strabo, *Geographica*, XVII, 1.8, trans. H.C. Hamilton (London: George Bell and Sons, 1903), quoted in *The Ancient Library of Alexandria*, http://www.alexandrianlibrary.org/?page_id=252 (accessed December 11, 2013); Murray, vol. 1, 2; Arthur MacGregor, *Curiosity and Enlightenment: Collectors and Collections from the Sixteenth to the Nineteenth Century* (New Have and London: Yale University Press, 2007), 1.

[*] The building that surrounded the entranceway onto the Acropolis proper.

[4] Pliny the Elder, *Natural History*, viii, 14(14), trans. John Bostock and Henry Thomas Riley (London: Henry G. Bohn, 1857), quoted in *The Perseus Digital Library*, http://www.perseus.tufts.edu (accessed December 11, 2013); Pausanias, *Description of Greece*, 1.22.6, trans. W. H. S. Jones and H. A. Omerod (Cambridge, MA: Harvard University Press, 1918), quoted in *Theoi,* http://www.theoi.com/Text/Pausanias1B.html (accessed December 11, 2013).

[5] Murray, vol. 1, 6.

[6] Martin Howley, "Relics At Glastonbury Abbey In The Thirteenth Century: The Relic List In Cambridge, Trinity College R.5.33 (724), Fols. 104r–105v", *Mediaeval Studies* 71 (2009): 197-234, EBSCO (accessed December 9, 2013).

[7] Andrea Kann, "Who Was the Audience for St. Luke's Cult in Padua?", in *Images, Relics, and Devotional Practices in Medieval and Renaissance Italy*, ed. Sally J. Cornelison and Scott B. Montgomery (Tempe, AZ: Arizona Center for Medieval and Renaissance Studies, 2006), 158.

developments that these early collections were housed alongside the main libraries of the era in establishments devoted to religious and philosophical study.

The later Middle Ages also saw the development of *Schatzkammers*, or treasuries, belonging to wealthy families such as the Medicis and the Habsburgs. Though these collections originally consisted of precious items and relics, by the sixteenth century collecting antiquities was in vogue, and the addition of coins, statuettes and other objects excavated at Rome transformed these *Schatzkammers*, designed to demonstrate wealth and prestige, into *Kunstkammers*, or cabinets of curiosities, meant for the study and appreciation of art.[8] Over time, especially as world travel increased, rare or exotic specimens of *naturalia* and *ethnographia* were also included as collectors strove to represent microcosms of the universe.[9] Books and manuscripts were another major component of these cabinets, and several prominent collectors, including Gian Vincenzo Pinelli (1535-1601) and Sir Robert Cotton (1530-1631), were better known for their libraries than their objects.[10] Throughout this period the collections and libraries were predominantly closed to the public, and access was limited to scholars and royalty who wished to study their contents. With a few early exceptions, most notably the 'Ark' collection owned by John Tradescant (1608-1662) that went on to become the Ashmolean Museum, it was not until the late seventeenth century that they became available to the common man.[11]

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[8] Thomas DaCosta Kaufmann, "From Treasury to Museum: The Collections of the Austrian Habsburgs", in *The Cultures of Collecting*, eds. John Elsner and Roger Cardinal (London: Reaktion Books, 1994), 137-141; Murray, vol. 1, 6-13; MacGregor, 9.

[9] Maria Zytaruk, "Cabinets of Curiosities and the Organization of Knowledge", University of Toronto Quarterly 80, no. 1 (2011): 1-23, EBSCO (accessed December 9, 2013), 2.

[10] Murray, vol. 1, 14; Katherine Birkwood, "'Our Learned Primate' and that 'Rare Treasurie': James Ussher's Use of Sir Robert Cotton's Manuscript Library, c. 1603-1655", *Library and Information History* 26, no. 1 (2010): 33-42, EBSCO (accessed December 11, 2013).

[11] Macgregor, 65; Birkwood, 34; Kaufmann, 139.

This widening of access occurred for two contrasting purposes with very different outcomes. The first was to raise funds by charging visitors admission that supported the collections and paid for their caretakers. Edward Lhuyd, for example, the keeper of the Ashmolean Museum from 1690 to 1709, received no salary, but rather sustained himself through the fees paid for access to the collection.[12] Since garnering sufficient fees required bringing in as many people as possible, some museums chose items that were "…attractive to the vulgar rather than useful to the learned", frequently in the form of deformed animals or people.[13] As will be discussed in the next chapter, this precedent of valuing crowd-driving entertainment over scholarly pursuit is one that has persisted in many institutions.

In opposition to the above turn, however, the second reason for granting the public access to museums was for their education or the betterment of their minds.[14] When Peter the Great made his cabinet available to the public in 1714, for example, he stated it was because "I want people to look and learn".[15] On the continent the presence of 'princely collections' owned by the royalty in Italy, Austria and Russia, among others, meant that this was simply a matter of opening the existing buildings to visitors of all classes.[16] In England, however, where princely collections never became popular, museums formed instead through an amalgamation of smaller collections donated or sold to the state by their owners.[17] One prominent example of this was the foundation of the British Museum, which was initiated through a proffer in the will of Sir Hans Sloane

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[12] Murray, vol. 1, 205.
[13] Murray, 205; MacGregor, 50.
[14] Tony Bennett, *The Birth of the Museum: History, Theory, Politics* (London & New York: Routledge, 1995), 109.
[15] Peter the Great, quoted in MacGregor, 66.
[16] Kaufmann, 152; MacGregor, 66-75.
[17] MacGregor, 17.

(1660-1753) that the Government buy his collection of over seventy thousand objects, forty thousand printed books, and four thousand manuscripts from his family for £20,000, a quarter of its actual value.[18] The Parliament raised funds through a lottery to do just that, and added to it the library of Sir Robert Cotton and the charters and manuscripts of Robert Harley (1661-1724), purchased for nominal fees from their inheritors as well, and in 1759 the British Museum opened making the combined collections available to the public.[19]

It was in this period that the term 'museum' began commonly being applied to cabinets of curiosities and the rooms containing them, and the word was included in the 1737 edition of Bailey's *The Universal Etymological English Dictionary* with the definition "A study or library; also a college or publick [sic] place for the resort of learned men".[20] Throughout pre-modern history the two sentiments expressed in this definition -- a connection to libraries and use by scholars -- defined the existence of museums. As discussed below, however, developments in the modern period separated these two information institutions and lessened the emphasis on collections as resources for academic study.

1.2 The Development of Modern Museums

Many historical accounts of museums, drawing on the opinion presented in Murray's *Museums: Their History and Their Use* published in 1904, the first such work written in English, align the point at which 'modern' museums emerged with the advent of scientific arrangement in the nineteenth century. In this period, museum displays

[18] Murray, 138-139.
[19] Ibid., 140.
[20] Murray, 38; Nathan Bailey, *The Universal Etymological English Dictionary,* eighth edition, London: 1737, quoted in David Murray, *Museums: Their History and Their Use* (Glasgow: James Maclehose and Sons, 1904), vol. 1, 36.

gradually ceased to be encyclopedic amalgamations of objects arranged by material according to religious conceptions of the world, and were instead split into separate collections of *antiquaria*, *naturalia*, *ethnographia*, and *technologia* organized taxonomically.[21] This orientation was considered more conducive to the instruction of visitors, and Murray praised the resulting 'special museums' as "…a necessary aid in scientific research", though recent post-modernist approaches have criticized the rigid limits this method imposes on the significance of objects.[22]

Not explicitly discussed in the above conception of modernization, however, is the separation of books from objects, a measure that began from the same impulse towards organization, but stretched beyond the date that Murray's book was published, ending with libraries and museums in North America becoming independent institutions. Given and McTavish discuss this process at length, using the museum of the Natural History Society of New Brunswick as a case study, and suggest that the philanthropy of Andrew Carnegie (1835-1919) contributed to the development by creating library buildings with separate or no space for museum collections.[23] Furthermore, while the endowments from the Carnegie foundation required municipalities to support the libraries financially, as William Frew emphasized in his speech at the 1895 opening of the Library, Art Gallery, Museum and Music Hall in Pittsburgh, "…the Art Gallery and

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[21] Murray, 231; MacGregor; Edward P. Alexander and Mary Alexander, *Museums in Motion: An Introduction to the History and Functions of Museums*, second edition (Lanham, MD: Altamira Press, 2008), 9-10; Michael J. Paulus, Jr., "The Converging Histories and Futures of Libraries, Archives, and Museums as Seen through the Case of the Curious Collector Myron Eells", *Libraries and the Cultural Record* 46, no. 2 (2011): 185-205, EBSCO (accessed November 10, 2013), 187.

[22] Murray, 231; Cameron, "Digital Futures II".

[23] Lisa M. Given and Lianne McTavish, "What's Old is New Again: The Reconvergence of Libraries, Archives, and Museums in the Digital Age", *The Library Quarterly* 80, no. 1 (2010): 7-32, EBSCO (accessed November 10, 2013), 14.

Museum, which the city is not to maintain" were treated differently.[24] The effect this steady separation had on the perspective of the library community can be seen in the contrast between an 1881 article by librarian Homes, declaring that having libraries and museum "…in the same building and under the same trustees, increases the utility or and the interest in both, with the least expenditure", and a 1924 article by American Library Association (ALA) President Jennings that includes museums and art galleries on a list of inappropriate additions that "…have been gradually grafted onto library work".[25]

This physical and intellectual separation of the institutions occurred in tandem with the professionalization of librarianship, as emphasized by the creation of recognized post-secondary degrees and the foundation of an overarching organizational body, the ALA, in 1876; acts which the museum community has yet to achieve with comparable success. In 1925 there were fourteen Master of Library and Information Science (MLIS) programs or the equivalent in America accredited by the ALA; today there are sixty-three and the credential is required "…for most professional level positions…".[26] In contrast, despite the equivalent Museum Association (MA) forming in the United Kingdom in 1889, and the American Association of Museums (AAM)[*] being established in 1906, the first degrees in Museum Studies were not created until 1952 at the Maharajah Sayarijao

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[24] Given and McTavish, 14; William Frew, quoted in Carnegie Institute, "Presentation of the Carnegie Library to the People of Pittsburgh with a Description of the Dedicatory Exercises, November 5, 1895", printed by Order of the Corporation and the City of Pittsburgh, quoted in Robert J. Gangewere, ed., *Palace of Culture: Andrew Carnegie's Museums and Library in Pittsburgh*, Pittsburgh: University of Pittsburgh Press, 2011.

[25] H.A. Homes, "Libraries with Museums", *The Library Journal* 6, no. 4 (1881): 97-104, http://libsysdigi.library.illinois.edu/oca/Books2007-07/proceedings/proceedings81amer/proceedings81amer.pdf (accessed December 9, 2013), 81; Judson T. Jennings, "Presidents Address: Sticking to our Last", *Bulletin of the American Library Association* 18 (1924): 150-156, JSTOR (accessed December 15, 2013), 151.

[26] *ALA: American Library Association*, "Accredited Library and Information Studies Master's Programs from 1925 through Present", http://www.ala.org/accreditedprograms/directory/historicallist (accessed December 15, 2013); *ALA: American Library Association*, "ALA Accredited Programs", http://www.ala.org/accreditedprograms/ (accessed December 15, 2013).

[*] Now called the American Alliance of Museums.

University in India, 1959 at the University of the *Museo Social Argentino*, 1966 at the University of Leicester, and 1969 at the University of Toronto.[27] Additionally, there is still no formal accreditation process governing museum studies programs, and as a result, I would argue, a report by the United States Department of Labor suggests that "…a master's degree in an appropriate discipline of the museum's specialty…" is seen as equal to a degree in museum studies for a curator, and "…a thorough knowledge of the museum's specialty and museum work experience…" are preferable to a museum studies degree for a technician position.[28]

These three factors: the reorganization of museums; their associated split from libraries; and their comparatively stunted professionalization, combined to define what 'modern' museums looked like and what their priorities were. While there were numerous results arising from these processes, for the purpose of this thesis two matters are of particular note. The first is the collection-centric orientation of museums. While libraries define themselves by their primary user groups with labels such as 'public', 'academic', 'special', and 'school', museums are identified by the objects they house, as in 'natural history', 'cultural heritage', 'science and technology', or 'fine art'. This is despite that the model employed by libraries applies equally to museums; there are institutions with general collections that are funded by the government, ones hosted by universities, and ones supported by third-party organizations, for example the American Numismatic Society, with very specialized collections. As MacDonald and Alsford

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[27] Jesus-Pedro Lorente, "The Development of Museum Studies in Universities: From Technical Training to Critical Museology", *Museum Management and Curatorship* 27, no. 3 (2012): 237-252, EBSCO (accessed December 15, 2013), 240.

[28] Bureau of Labor Statistics, "Curators, Museum Technicians, and Conservators", *Occupational Outlook Handbook*, http://www.bls.gov/ooh/Education-Training-and-Library/Curators-and-museum-technicians.htm#tab-4 (accessed November 13, 2013).

wrote, this "introverted focus", which persisted until the late 1970s, contributed to museums gaining "…a popular image as forbidding institutions…", limiting the number of public visitors to the institutions.[29]

The second consideration to be addressed is the lack of standards governing the creation of museum records. Although vocal advocates from both libraries and museums have been publishing articles since the turn of the century calling for consistency in the ways books or objects are described and organized, the effectiveness of the efforts has differed between the organizations.[30] While names such as Dewey, Cutter, and Poole are well known in LIS as the pioneers of the cataloguing, classification and indexing methods still used today, in museums there was no such adoption of standard practices. As Bearman notes, museum records "…tended to reflect the idiosyncratic interests of curators…" and there was thus limited intra-institutional consistency, let alone inter-institutional standards.[31] Several reasons have been suggested why standardization never took hold in museums. One major argument is that unlike books, objects are relatively unique and are not uniform, meaning that no external descriptive service, such as the card catalogue services of the Library of Congress, was possible, and that devising consistent fields was problematic. Another is that there was no loaning of materials between museums the way there is in libraries, making interoperability of systems less of a

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[29] George F. MacDonald and Stephen Alsford, "The Museum as Information Utility", *Museum Management and Curatorship* 10 (1991): 305-311, EBSCO (accessed November 9, 2013), 305; see also John Reeve and Vicky Woollard, "Influences on Museum Practice", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England and Burlington, VT: 2006).

[30] See early volumes of *The Library Journal* (ca. 1881-1882), particularly issues those presenting proceedings from ALA conferences, and *The Museums Journal* (ca. 1901-1902).

[31] David Bearman, "Representing Museum Knowledge", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 41.

concern.[32] I would argue that an additional factor is the role library schools played in inculcating standard methods to new librarians, a component that museums, whose employees were not professionally trained, did not have. Regardless of the reason, as the next section will discuss, with the advent of the digital age the poor state of records in museums has had a significant effect on current efforts in these organizations.

1.3 Recent Developments in Museums

In the past few decades, driven by advancements in technology, the introduction of requirements from governments and funding bodies, and an increase in the expectations of users, museum have changed their operational practices in both the physical and digital realms.[33] This discussion will focus on four aspects of these changes that are relevant to the research presented in this thesis: the digitization of museum records, the creation of inter-institutional networks, the introduction of the museum informatics sub-discipline, and ongoing efforts to establish metadata standards in museums. Another major development, virtual exhibits, will be discussed in the next chapter in the context of the public users for which they are intended.

1.3.1 Digitization

As supercomputers began to be widely used in the late 1960s, curators and museum officials were quick to recognize the potential of the devices for maintaining records, but were slow to actually implement their use. A few of the largest institutions adapted the General Retrieval and Information Processor for Humanities Oriented Studies

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[32] Robert Chenhall and David Vance, "The World of (Almost) Unique Objects", in *Museum Collections and Today's Computers* (New York, Westpoint, CT, and London: Greenwood Press, 1988), quoted in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 4-7.

[33] Caroline Lang, John Reeve and Vicky Woollard, "The Impact of Government Policy", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England and Burlington, VT: 2006), 21; Andrew Roberts, "The Changing Role of Information Professionals in Museums", *MDA Information* 5, no. 3 (2001): 15-17, quoted in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 25-27.

(GRIPHOS) created for the United Nations library to contain object records, an effort backed by the newly formed Museum Computer Network (MCN), while in 1970 the Smithsonian created their own program, the Self Generating Master (SELGEM), and made it available to other museums.[34] Studies done in the early 1980s, however, showed that well under ten percent of museums in the United Kingdom or America were using computers to house their records.[35] Canadian museums were somewhat better equipped, as 150 of the largest institutions were provided with microcomputers as part of the Canadian Heritage Information Network (CHIN), discussed further below.[36] The few museums that did begin digitizing their information in this period, though, quickly discovered that their paper records were incomplete, incorrect, and inconsistent, meaning that staff had to improve the information as it was being entered into the system, a time consuming and labour intensive process.[37]

In addition, these early databases were intended solely for in-house use to facilitate collection management, not as a tool for users.[38] It was not until the creation of the World Wide Web (W3) that providing the public with access to records became a

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[34] David Williams, *A Guide to Museum Computing* (Nashville: American Association for State and Local History, 1987), quoted in "A Brief History of Museum Computerization", in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 17-18.

[35] Andrew D. Roberts and Richard B. Light, "The Cooperative Development of Documentation in United Kingdom Museums", in *Museum Documentation Systems: Developments and Applications*, ed. Robert B. Light, D. Andrew Roberts, and Jennifer D. Stewart (London: Butterworths and Company, 1986), 123; Museum Documentation Association, "Microcomputers in Museums", *MDA Occasional Paper* 7 (1984), eds. Richard B. Light and D. Andrew Roberts (Duxford, Cambridgeshire: Museum Documentation Association, 1984), 1; David Vance, "The Museum Computer Network in Context", in *Museum Documentation Systems: Developments and Applications*, ed. Robert B. Light, D. Andrew Roberts, and Jennifer D. Stewart (London: Butterworths and Company, 1986), 37.

[36] Jane Sledge and Betsy Comstock, "The Canadian Heritage Information Network", in *Museum Documentation Systems: Developments and Applications*, ed. Robert B. Light, D. Andrew Roberts, and Jennifer D. Stewart (London: Butterworths and Company, 1986), 7-11.

[37] Lenore Sarasan, "A System for Analysing Museum Documentation", in *Museum Documentation Systems: Developments and Applications*, ed. Robert B. Light, D. Andrew Roberts, and Jennifer D. Stewart (London: Butterworths and Company, 1986), 89.

[38] Ross Parry, "The Practice of Digital Heritage and the Heritage of Digital Practice", in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 1; Chenhall and Vance, 9.

goal of the museum community. On the heels of Tim Berners-Lee's 1991 release of the W3 project, MacDonald and Alsford published an article both supporting the growing user-focus of museums and suggesting that "the marriage of computers and telecommunications could, ultimately, allow museums to become 'information utilities'… available in every home".[39] Much of the early literature concerning museums and the web was very optimistic about the potential of the technology, and within a few years enough institutions had built websites that directories were created to help find them.[40] In reality, however, the websites in this period "…were nothing more than informational flyers" or were effectively "…a postcard from their museum", and numerous articles critical of their design appeared in the latter half of the decade.[41] Scholars from science, archaeology, and art backgrounds published articles calling for "…a complete inventory…" of items, access to "…information in accession files…" contextualizing the objects, real time updates to the information as discoveries were made, and designs that "…exploit [the Web's] powerful ability to be interactive".[42] The most recent efforts, following the advice of Hertzum's article "A Review of Museum

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[39] MacDonald and Alsford, 305-308.

[40] Sara Champion, "Archaeology on the World Wide Web: A User's Field Guide" (1997), *Antiquity*, http://antiquity.ac.uk/Listing/eleccham.html (accessed October 24, 2013); Lindsay Allason-Jones, Colm O'Brien, and Glyn Goodrick, "Archaeology, Museums, and the World Wide Web", *Journal of European Archaeology* 3, no. 2 (1995): 33-42; Bruno Mannoni, "Bringing Museums Online", *Communications of the ACM* 39, no. 6 (1996): 100-105, EBSCO (accessed November 10, 2013); Richard Sabin, "Museums and Their Websites: An Examination and Assessment of How Museums are Coping with the Challenge of the World Wide Web", Journal of Conservation and Museum Studies 2 (1997): 6-10, DOI: http://dx.doi.org/10.5334/jcms.2972 (accessed November 10, 2013), What Is Out There, para. 1; Jennifer Trant, "Editorial: Museums and the Web", *Archives and Museum Informatics* 11 (1997): 73-76, EBSCO (accessed November 10, 2013), 73.

[41] Katherine Burton Jones, "The Transformation of the Digital Museum", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 21; Sabin, The World Wide Web – Why Bother? Professional Views, para. 6.

[42] Luis Alfredo Baratas Diaz and Angeles del Egido, "Science Museums on the Internet", *Museum International* 51, no. 4 (1999): 35- 41, EBSCO (accessed November 10, 2013), 38; John W. Hoopes, "The Future of the Past: Archaeology and Anthropology on the World Wide Web", *Archives and Museum Informatics* 11 (1997): 87-105, EBSCO (accessed November 10, 2013), 93; Peter Walsh, "The Web and the Unassailable Voice", *Archives and Museum Informatics* 11 (1997): 77-85, EBSCO (accessed November 10, 2013), 82.

Web Sites: In Search of User-Centred Design", have tried to better understand the needs of users and to build websites that meet them, but as will be shown in the next chapter, the focus of these inquiries have left academic scholars as a forgotten user group.[43]

1.3.2 Networks

In 1972 the National Museums of Canada (NMC) organization, in one of "…the most ambitious advances in the use of automated systems…", created the National Inventory Program (NIP), the then largest attempt to create a centralized electronic inventory of museum records.[44] The state of existing records, the crude technology of the time, and the design of the system itself – as with most databases, the product of computer scientists who did not understand the work that needed to be done – caused progress to be extremely slow, and by 1980 the viability of the goal was being questioned.[45] In 1982 the database was combined with other systems, including the Conservation Information Network, to form CHIN as referenced above, but many of the issues continued, and it was predicted that in a large museum it would take about five years to edit and enter the records for a single department.[46] A report released in 1999 suggested that improvements to Internet speed had increased the pace of digitization, but that the "…challenges of documentation and technology standards are ongoing".[47] Today the database is available online through Artefacts Canada as *CHIN's Professional Exchange*, but an examination of the records shows that there is still little consistency in

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[43] Morten Hertzum, "A Review of Museum Web Sites: In Search of User-Centred Design", Archives and Museum Informatics 12 (1998): 127-138, EBSCO (accessed November 10, 2013).

[44] Richard B. Light, D. Andrew Roberts, and Jennifer D. Stewart, "Introduction", in *Museum Documentation Systems: Developments and Applications*, eds. Richard B. Light, D. Andrew Roberts, and Jennifer D. Stewart London: Butterworth and Company, 1986, 1; Sledge and Comstock, 7; Wendy A. Thomas, "Developing a National Web Site: The Canadian Experience", *Museum International* 51, no. 4 (1999): 14-19, EBSCO (accessed November 20, 2013), 14.

[45] Sledge and Comstock, 7; Chenhall and Vance, 4.

[46] Sledge and Comstock, 8-13.

[47] Thomas, 16.

the metadata fields used or the values that fill them.[48] In addition, as the name suggests, the intention of the project remains to provide "…a comprehensive set of resources for heritage professionals and the interested public"; other user groups are a secondary concern behind museum staff.[49]

In contrast, the *Europeana: Think Culture* website initially released in 2008 was designed to provide the public with access to the material housed in European libraries, archives and museums (LAMs).[50] Despite some issues arising from an unexpected level of public interest and a "…thinness of the metadata" in museum records, measures taken in advance to prevent the types of issues that plagued the CHIN system seem to have been successful.[51] Several 'work packages' or investigative teams were created to: explore the content providers' perspectives; develop metadata standards and interoperability protocols; address "…the need for the site to be available in all the 23 official languages of the EU"; design the technical architecture; and identify potential users and "…the features and functionality required in the portal" to meet their needs.[52] As of 2011 the system provided access to over fifteen million items from fifteen hundred European LAMs, and offers both search and browse options as well as online exhibits.[53] While the project is too new to know if the poor intra- and inter-institutional standards that have characterized museum records will persist, the intentions and design of *Europeana* are indicative of the direction these organizations are heading.

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[48] Canadian Heritage Information Network, *CHIN's Professional Exchange*, http://www.pro.rcip-chin.gc.ca/bd-dl/artefacts-eng.jsp (accessed December 18, 2013).

[49] Thomas, 15.

[50] Jon Purday, "Think Culture: Europeana.eu from Concept to Construction", *Bibliothek* 33, no. 2 (2009): 170-180, EBSCO (November 10, 2013), 171; Candice Kail, "Europeana: Think Culture", *Journal of Web Librarianship* 5 (2011): 256-261, EBSCO (accessed November 19, 2013), 256.

[51] Purday, 171; 175.

[52] Purday, 173-174.

[53] Kail, 256-260.

Outside of museums studies, a recent project by digital humanities scholars in the Acadia University branch of the Inventing New Knowledge Environments (INKE) research group takes the concept of an information network even farther. As presented at the 2014 Canadian Society of Digital Humanities (CSDH) conference, *NewRadial* was designed to be a digital workspace that uses meta-adapters to search for records from numerous existing databases, including *Europeana*.[54] The prototype currently searches for textual and photographic material rather than artefacts, but as more regional, national or continental museum network initiatives develop, the technology offers an opportunity for a meta-network of collections around the world. A strength and a weakness of the system on this front is that *NewRadial* specifically avoids the need for standardized metadata by matching search fields and queries to the API being used. This allows records from locations as diverse as the ArchBook Database and Marvel Comics to be brought together without cross-walking metadata, but also means that much as in the present CHIN database, the information available in the resulting records is extremely disparate. While this technology thus holds great potential to make museum records available globally, it cannot replace strong metadata standards to ensure those records sufficiently represent the objects they describe.

1.3.3 Museum Informatics

Beginning in the late 1980s, though not really taking hold until the new millennium, the field of museum informatics arose to address the issues of collection-centricity and non-standardization. As Marty, one of the most prolific authors in the area, defines it, the field examines the "…intersection of people, information and technology in

[54] Jon Saklofske, Jake Bruce and Ian Brunton, *NewRadial: Prototype Visual Environment for Humanities Research*, http://inke.acadiau.ca/newradial-dev (accessed May 28, 2014).

museums" by applying the principles of other disciplines, including library and information studies, computer science, and human-computer interaction (HCI).[55] As demonstrated in a study published by Marty, since the digitization of records has become a standard museum goal, the skills traditionally taught to LIS professionals, such as information representation, organization, and management, have become an important part of what museum professionals are expected to know and do in their jobs.[56] Interestingly for the purpose of this thesis, however, evaluative methods, defined as "…the process of assessing the ability of information systems or resources to meet the information needs of users…", scored among the lowest of what museum professionals actually do, know how to do, or feel they need to know.[57] Thus while the introduction of museum informatics is having a promising effect on the priorities of museums for addressing longstanding problems, there are still gaps in the work being done.

1.3.4 Museum Metadata Standards

Since the 1980s, groups have been developing standards to improve the consistency and quality of museum records within and between institutions. The Getty Institute of America oversees both the Art and Architecture Thesaurus (AAT) and Categories for the Description of Works of Art (CDWA), both originally published in the 1990s, while a taskforce under the Visual Resource Administration released the

[55] Paul F. Marty, "An Introduction to Museum Informatics", in *Museum Informatics: People, Information, and Technology in Museums*, ed. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 3-5; see also Paul F. Marty and W. Boyd Rayward, "Museum Informatics", *Annual Review of Information Science and Technology* 37, no. 1 (2003): 259-294, EBSCO (accessed November 10, 2013).

[56] Paul F. Marty, "Museum Professionals and the Relevance of LIS Expertise", *Library and Information Science Research* 29 (2007): 252-276, EBSCO (accessed November 10, 2013), 260-263.

[57] Marty, "Museum Professionals", 260.

Cataloguing Cultural Objects (CCO) standard in 2006.[58] All of these initiatives are focused predominantly on fine art collections in their content, but for these objects they work in tangent to provide through guidelines on what fields and content should be included in a record.

Another example that focuses on cultural heritage materials is the Conceptual Reference Model (CRM) produced by the International Council of Museums' (ICOM) International Committee for Documentation (CIDOC). The standard, first published in 1999, consists of over two hundred and fifty hierarchical classes and properties meant to define the "…database schemata and document structures used in cultural heritage and museum documentation…" specifically for object description.[59] It has also spawned several purpose-specific sub-standards, such as that produced by the Archaeological Sites Working Group.

Despite these efforts, however, very few museums have implemented standards into their cataloguing practices. A study by Rinehart and White in 2004 showed that only about a hundred of the over 17,500 institutions in the United States, or less than 1 percent, were using any metadata standard at all.[60] The reasons cited for this poor acceptance of the guidelines resulting from these initiatives generally relate to time and money. Rinehart and White suggest that the standards "…are too complex for ready

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[58] Getty Research Institute, *Art and Architecture Thesaurus Online* (2000), http://www.getty.edu/research/tools/vocabularies/aat/ (accessed December 9, 2013); Getty Research Institute, *Categories for the Description of Works of Art* (2014), eds. Murtha Baca and Patricia Harpring, https://www.getty.edu/research/publications/electronic_publications/cdwa/ (accessed March 26, 2014); Murtha Baca and the Visual Resources Association, *Cataloging Cultural Objects: A Guide to Describing Cultural Works and Their Images* (Chicago: American Library Association, 2006), EBSCO (accessed December 9, 2013).

[59] International Council of Museums, *Definition of the CIDOC Conceptual Reference Model*, version 5.1.2, eds. Patrick Le Boeuf, Martin Doerr, Christian Emil Ore, and Stephen Stead, http://www.cidoc-crm.org/docs/cidoc_crm_version_5.1.2.pdf (accessed July 27, 2014).

[60] Richard Rinehart and Lanya White, "Challenges to Museum Collaboration: The MOAC Case Study", in *Museum Informatics: People, Information, and Technology in Museums*, ed. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 246.

adoption by the average cultural institution…" because they are being created by "…umbrella organizations that are not themselves responsible for implementing the standard".[61] Bearman, meanwhile, commenting on AAT shortly after it was released, criticized that one of the main traits of a standard should be that it makes creating digital representations cheaper.[62] As noted above, the continuing lack of regulation for museum staff education may also play a role, as many curators and registrars are not trained in the use of these standards, nor their importance to the utility of records. Whatever the reason, as later chapters will show, this limited adoption of standards has had a clear effect on the quality and consistency of online museum catalogues that has impacted their information authority.

Understanding the history of museums and the ongoing issues that have arisen over the last few decades will help contextualize the research questions posed in the remainder of this thesis. When museums diverged from libraries at the turn of the century, a clear contrast existed in the level of professionalization between the two institutions, the results of which defined their progression thereafter. Two of the largest issues still facing museums in their efforts to digitize records are the struggle to establish widespread standards, and their deficient knowledge of the needs of their audiences. The remainder of this thesis will address the latter problem as it relates to scholarly users, and will provide a framework for website record and design standards to ensure museum websites can serve this population.

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[61] Rinehart and White, 246.

[62] David Bearman, "Standards for Networked Cultural Heritage", *Archives and Museum Informatics* 9, no. 3 (1995): 279-307, quoted in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 49-51.

Chapter 2 – Defining Museum Users

As the focus in museums has slowly shifted from collections to users over the past half century, the attention paid to particular groups has been disproportionate. In 1853 Forbes warned that the common man was not being sufficiently considered, writing that:

> *...museum and public collections of all kinds are too often regarded by their curators in their scientific aspect only, as subservient to the advancement of knowledge through the medium of men of science or learning, and consequently as principally intended for the use of very few persons.*[63]

The recent efforts to address this longstanding problem, however, amount to an overcorrection, wherein rather than considering all audience groups equally or proportionally, publications have concentrated almost exclusively on the general public, while Forbes' 'men of science or learning' have been entirely ignored. For the purposes of this thesis, the key concern in this switch is that the time at which scholars were de-emphasized coincided with digitization movement, and thus it has never been determined whether museum websites are meeting the needs of academic researchers.

This chapter will define several of the core user groups of museums and summarize some of the research that has been done on them, in order to demonstrate both that scholars are an audience with unique needs, and that they are not being treated as such by the literature. It will then attempt to quantify how significant scholars are as a group by synthesizing the results of studies conducted on museum users from the late 1990s to the present. Researchers remain a considerable segment of the audience in

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[63] Edward Forbes, "On the Educational Uses of Museums", *Museum of Practical Geology, Metropolitan School of Science, Applied Mining and the Arts, Department of the Board of Trade* (London: Longman, Brown, Green, and Longmans, 1853), quoted in Hugh H. Genoways and Mary Anne Andrei, eds., *Museum Origins: Readings in Early Museum History and Philosophy* (Walnut Creek, CA: Leftcoast Press, 2008), 253.

museums and it is important that their information requirements are considered, particularly in the digital environment.

2.1 User Groups

Determining how to classify museum users is challenging, as there have been numerous models that have changed with societal culture and the priorities of the institutions. In an article on mineralogical collections published in 1901, for instance, Goodchild identified four 'classes of visitors': "(1) the general public, (2) the student working for examination purposes, (3) the practical man, who looks upon minerals only from a commercial point of view, and (4) the scientific student".[64] Comparatively, in a 2006 paper entitled "Prioritizing Audience Groups", Reeve highlighted children and families; schools and teachers; teenagers and young adults; adults and lifelong learning; and disabled people as "key target groups", dramatically expanding Goodchild's 'general public' while cutting commercial and academic users.[65] In a 2003 article by Cameron, meanwhile, the audiences of museum websites included "…curators, collection managers, educators and non-specialists", adding several museum professionals onto the list.[66]

In the following discussion, four groups will be included chosen based on precedence in such previous classifications, as well as their relevance to the overall thesis through a contrast with or connection to scholars. The audiences include the general

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[64] J.G. Goodchild, "On the Arrangement of Mineralogical Collections", *The Museums Journal* 1 (1901-1902): 193-198. Internet Archive. http://archive.org/stream/museumsjournal00assogoog#page/n263 /mode/2up (accessed December 15, 2013), 193.

[65] John Reeve, "Prioritizing Audience Groups", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England; Burlington, VT: 2006), 48-53.

[66] Fiona Cameron, "Digital Futures I: Museum Collections, Digital Technologies and the Cultural Construction of Knowledge", *Curator* 46, no. 3 (2003): 325-340. EBSCO (accessed November 13, 2013), 'The Next Generation', para. 2.

public and divisions therein, students and teachers, museum staff, and academic researchers.

2.1.1 General Public

This catchall title has been criticized for its broadness and flattening out the needs of subclasses, equating such disparate groups as children and tourists.[67] The current trend in literature is instead to strive for granularity in defining the public audience, so that entire articles are dedicated, for example, to ensuring adequate service for the deaf.[68] While this research is important to ensure equitable access to museums by all, such a specific breakdown of communities is beyond the scope of this paper, and the volume of scholarship that exists in the area makes a recounting unnecessary. A list of divisions compiled by Lang is a sufficient summary for the purpose of demonstration; there are groups based on "…intellectual, cultural, attitudinal/social, financial and so on, as well as physical and sensory" factors.[69]

While each of these subclasses has their own needs and interests in museums, in general the public looks to these institutions for what Dilevko and Gottlieb term 'edutainment'. As the authors describe it, in an attempt to compete with movies and theme parks for ticket sales, since the 1990s museums have attempted to create an

[67] Reeve, "Prioritizing Audience Groups", 43.

[68] Elana Kalisher, "Reexamining Diversity: A Look at the Deaf Community in Museums", *Curator* 41, no. 1 (March 1998): 13-35, EBSCO (accessed January 3, 2014); Jane Samuels, "A Collective Responsibility: Making Museum Accessible for Deaf and Disabled People", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England; Burlington, VT: 2006).

[69] Caroline Lang, "The Public Access Debate", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England; Burlington, VT: 2006).

entertaining experience that also imparts some degree of education.[70] On many levels this harkens back to the 'vulgar' exhibitions of rarities and deformities prominent in the eighteenth century as discussed in the previous chapter that prioritized raising funds over providing substance. Dileviko and Gottlieb note specifically that there was concern "…the edutainment model diminished scholarship" in museums, though proponents countered that attracting visitors through the doors was vital if any educational information was to be imparted, and an entertainment value was an effective draw.[71] In the digital realm, this has translated to virtual exhibits, which though free to access online can drive up interest in a museum and lead to more visitors. An early example of this was the 'Flints and Stones' virtual exhibit created in 1995 and described by Allason-Jones et al.. Capitalizing on the release of *The Flintstones* movie, the physical exhibit augmented artefacts and text with cartoonish wall paintings and live actors to instruct visitors about the pre-historic world. As far as was possible, the display was reproduced online to reach a larger audience.[72] More recent conceptions of virtual exhibits call for information beyond what is possible in physical museums and an increased interaction between virtual visitors and museum staff.[73]

The latter is part of a larger movement towards Post-Structural museums, in which curators are no longer treated as the absolute authority on objects or artworks, but instead a multiplicity of perspectives are acknowledged and represented in museum

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[70] Juris Dilevko and Lisa Gottlieb, *The Evolution of Library and Museum Partnerships: Historical Antecedents, Contemporary Manifestations, and Future Directions* (Westport, CT and London: Libraries Unlimited, 2004), 2-3.

[71] Dilevko and Gottlieb, 3.

[72] Allason-Jones, O'Brien, and Goodrick, 33-34.

[73] Walsh, 84; Jorgen Riber Christensen, "Four Steps in the History of Museum Technologies and Visitors' Digital Participation", *MedieKultur* 50 (2011): 7-29, EBSCO (accessed February 10, 2013); Roland Jackson, "The Virtual Visit: Towards a New Concept for the Electronic Science Centre", in *Museums in a Digital Age*, ed. Ross Parry (New York: Routledge, 2010), 156-157.

records. A theoretical paper by Srinivasan et al. calls such a step 'Museum 2.0', drawing on the popularity of Web 2.0 technology and the related change in users' expectations, and presents several compelling case studies from around the world.[74] An additional case study presented by Marselis discusses the positive effect that a two-way museum experience can have on a community, in this case a particular minority population in the Netherlands.[75] A study on the perspective of users and museum staff concerning such crowd-sourced object descriptions, however, found that "…not all interpretations are seen as equal by users and museums must continue to provide reliable information based on scholarly research".[76] While aspects of folksonomies and user-built virtual exhibits might also have bearing on an academic audience, the emphasis on entertainment value and a movement towards less authoritative records are not reflective of the needs of researchers.

2.1.2 Students and Teachers

Under this category is included particularly those in primary and secondary education, though post-secondary students and professors could be included when in a classroom setting. The complication introduced by the dual role of users who are both educators and researchers will be discussed further in the next section, as it affects the accuracy with which user groups can be quantified. The uses of museum websites in a classroom include for demonstrations and for assignments, meaning resources need to

[74] Ramesh Srinivasan, Robin Boast, Jonathan Furner, and Katherine M. Becvar, "Digital Museums and Diverse Cultural Knowledges: Moving Past the Traditional Catalog", *The Information Society* 25 (2009): 265-278, EBSCO (accessed November 10, 2013).

[75] Randi Marselis, "Digitising Migration Heritage: A Case Study of a Minority Museum", *MedieKultur* 50 (2011): 84-99, EBSCO (accessed February 10, 2013).

[76] Cameron, "Digital Futures II", 250; see also Fiona Cameron and Sarah Mengler, "Complexity, Transdisciplinarity and Museum Collections Documentation: Emergent Metaphors for a Complex World", *Journal of Material Culture* 14, no. 2 (2009): 189-218, EBSCO (accessed November 10, 2013).

"…support student projects with a range of interpretive opportunities…".[77] The literature is torn on how active museums should be in creating education-friendly designs; some authors support reaching out to schools and working with teachers to increase museum use as part of the mandate of the institutions, while others caution that "…museums will suffer if they are forced to shoulder the responsibility for education".[78] Though this argument is beyond the scope of this thesis, it is a relevant consideration that the contextually rich "linear narrative" resources that are ideal for classroom settings are not conducive to primary research.[79]

2.1.3 Museum Staff

The original and still prominent users of digital museum records were the institutions' staffs. Curators, exhibit designers and administrators must access information on both their own objects and comparable ones from other museums for the purposes of documenting and maintaining the pieces. Since part of this work involves the same type of raw data analysis and comparison that an academic researcher might perform, this group is consistently equated with scholars in the literature. For example, Hertzum, in an article advocating better understanding of user needs, asserts that "researchers have a lot in common with museum curators and are thus a rather well-understood user group".[80] An article by Zorich that calls for a change to activity-centric records, however, includes a list of activities that are part of the normal museum workday that indicates just how unaligned with scholars the information needs of museum staff

[77] Cameron, "Digital Futures I", 'The Next Generation', para. 25.
[78] Jim Devine, "Partnerships for Progress: Electronic Access and Museum Resources in the Classroom", in Museum Informatics: People, Information, and Technology in Museums, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008); Lang, 30.
[79] Cameron, "Digital Futures I", 'The Next Generation', para. 24.
[80] Hertzum, 129.

are. In addition to cataloguing and publication, their work includes, among others, acquisition, conservation, exhibition, education, and storage, all activities that require metadata of limited use to an academic researcher, yet which receive greater priority because they are vital to staff.[81]

Numerous studies have been published that focus on curators and other museum professionals as users, and their results demonstrate the clear differences in priorities between this group and scholars. A Master's thesis completed in the Museum Science program at Texas A&M discusses the benefits of including barcode identifiers in a database design in order to keep track of objects in a specimen collection.[82] An article by Hess et al. examines recreating artefacts in three dimensions for analysis specifically to "…enable curators and conservators to compare high-resolution 3D colour records… in order to assess and monitor change".[83] As a final example, a paper by Marty considers a case study of the Spurlock Museum at the University of Illinois where an improved digital record design allowed the collection to be moved across campus into new exhibits designed electronically.[84] While the author also notes that the changes allow the system "…to access any given record in any given database and organize the results in a fashion appropriate to any given user, exhibit designer, curator, or scholar", the uses by those

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[81] Diane M. Zorich, "Information Policy in Museums", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 86-87.

[82] Ligia Tamara Enriquez, "Catalog of the Invertebrate Type Collection of the Museum of Texas Tech University: Barcodes, Digital Imagery, and Database Web Access", Master's thesis, Texas Tech University, August 2007, http://repositories.tdl.org/ttu-ir/bitstream/handle/2346/22172/Enriquez_Ligia_Thesis.pdf?sequence=1 (accessed February 10, 2013).

[83] Mona Hess, et al., "Well Connected to Your Digital Object? E-Curator: A Web-based e-Science Platform for Museum Artefacts", *Literary and Linguistic Computing* 26, no. 2 (2011): 193-215, EBSCO (accessed February 10, 2013), 194.

[84] Paul Marty, "On-Line Exhibit Design: The Sociotechnological Impact of Building a Museum over the World Wide Web", *Journal of the American Society for Information Science* 51, no. 1 (2000): 24-32, EBSCO (accessed November 10, 2013).

exhibit designers and curators as outlined in the article emphasize their distinct information needs.[85]

2.1.4 Academic Researchers

The final class of museum users, the focus of this thesis, requires a fairly specific definition, if for no other reason than that none of the scarce literature in the field that acknowledges the group at all is precise in stating its boundaries. I would define academic researchers to include persons at all levels of post-secondary education: undergraduates, graduates, and faculty. It is at this level, as Bates notes in one of the reports emerging from the Getty Online Searching Project, that students "…move from studying secondary works… to studying primary materials and coming up with their own understanding of them".[86] Although the prior knowledge, information needs, and resulting research product can differ vastly between an undergraduate student and a faculty member, people at all levels of post-secondary institutions share the requirement of access to raw data in addition to, or in place of interpreted narratives. Marty, one of the few authors to consistently acknowledge scholars as a user group, recognizes this difference in an article profiling audiences, noting that "academics are likely to prefer to generate their own contexts for artifact data, working with the raw data only".[87] This need clearly separates scholars from the general public audiences that most museum websites cater to, and as discussed above, although museum professionals also need access to raw

[85] Marty, "On-Line Exhibit Design", 28.

[86] Marcia J. Bates, "The Design of Databases and Other Information Resources for Humanities Scholars: the Getty Online Searching Project Report No.4", *Online & CD-Rom Review* 18, no. 6 (1994): 331-340, 332.

[87] Paul F. Marty, "Museum Informatics and Collaborative Technologies: The Emerging Socio-Technological Dimension of Information Science in Museum Environments", *Journal of the American Society for Information Science* 50, no. 12 (1999): 1083-1091, EBSCO (accessed November 10, 2013), 1087.

data, many of the tasks curators and exhibit designers perform require a very different set of metadata than scholars are likely to find useful.

Despite these differences, the unique needs of scholars are not reflected in the literature, and there is a poor understanding in the field of whether digital museum resources are adequate for scholars or how they might be improved. There are a few projects to create digital tools specifically for academic users, but these do not involve studies of potential users, and instead make assumptions about their information needs or draw on the standards developed in other fields such as LIS. Examples include a project by Pigney and Hunt to create a database of early Modern prints, and another by Humphrey recreating three-dimensional models of jewelry from sculptures and paintings.[88] Alternatively, the rare theoretical research project that includes scholars generally equates them with museum staff or other users, such as in a study by Amin et al. on cultural heritage experts that included researchers, curators, registrars, IT professionals, teachers, and students with no distinction between the groups in the results.[89]

The poor state of knowledge and literature in this area is on some level a conscious decision, justified by the comparatively small proportion of users who are classified as academic researchers. Dunmore, for instance, after quoting a study done by consultants Morris Hargreaves McIntyre (MHM) on the Birmingham Museums and Art

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[88] Stephen Pigney and Katherine Hunt, "A Virtual Museum or E-Research? *British Printed Images to 1700* and the Digitization of Early Modern Prints", in *Digitizing Medieval and Early Modern Material Culture*, eds. Brent Nelson and Melissa Terras (Toronto: Iter, 2012); David Humphrey, "Simulating Splendour: Visual Modelling of Historical Jewellery Research", in *Digitizing Medieval and Early Modern Material Culture*, eds. Brent Nelson and Melissa Terras (Toronto: Iter, 2012).

[89] Alia Amin, Jacco van Ossenbruggen, Lynda Hardman, and Annelies van Nispen, "Understanding Cultural Heritage Experts' Information Seeking Needs", in *Proceedings of the 8th ACM/IEEE-CS Joint Conference on Digital Libraries*, eds. Ronald L. Larsen, Andreas Paepcke, Jose Luis Borbinha, and Mor Naaman (New York: ACM, 2008), 41.

Gallery that suggested only 1 percent of users were researchers and only another 9 percent would use search options, concluded that "…it is obvious what sort of design will result in best value for money".[90] Likewise Marty, after discussing at length how useful access to museum databases could be for academic researchers, recommends focusing on "…interpretive, educational information resources…" rather than tools that will help "…only a handful of scholars".[91] Although resources of time and money will inevitably be a factor in study designs and website systems, supporting scholarship has been a core purpose of museums since the institutions were created. As Young discusses at length in his book detailing the downfall of a university museum in Montreal, ignoring academic users can have dire consequences on the use of digital and physical resources, and "…the demeaning of university research as peripheral to a museum's main mission…" can lead to the collapse of these institutions.[92]

In the next section an examination of several studies quantifying museum user groups will test the claim that scholars are too insignificant an audience to be considered, in order to justify the research presented in the remainder of this thesis.

2.2 Estimating the Size of the Scholarly User Group

There have been numerous studies examining the nature of museum users both online and in person over the past fifteen years, some focusing on aspects of information-seeking behaviour, and some seeking only demographic information. The seven studies to be discussed below each shed some light on how many visitors may be researchers,

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[90] Caroline Dunmore, "Museums and the Web", in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, eds. Caroline Lang, John Reeve, and Vicky Woollard (Aldershot, England; Burlington, VT: 2006), 107.

[91] Paul F. Marty, "Information Representation", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 31.

[92] Brian Young, *The Making and Unmaking of a University Museum: The McCord, 1921-1996* (Montreal and Kingston: McGill-Queen's University Press, 2000), 5.

whether through questions about education level, background knowledge, the purpose of the visit, or directly requesting respondents to classify themselves. While these widely different approaches make it difficult to name an exact percentage, the following discussion will summarize the results of each study, as well as factors that make them more or less reliable, and will conclude with a range of how large this user group might be.

The lowest estimate comes from the study by MHM as reported by Dunmore as discussed above, in which users were classified by the consultants into one of four categories: browsers who "wander randomly until an object grabs their attention"; followers who "want the museum to select objects"; searchers who "visit the museum to learn about particular objects"; and researchers who "have expert knowledge and expect specialist access".[93] It is not discussed in Dunmore's account how many users were included in the study, how their behavior was assessed, or how their classification was ultimately decided. The results indicate that 1 percent of users were researchers, 9 percent were searchers, 50 percent were browsers, and 40 percent were followers.[94] Although the 1 percent suggested is low enough that scholars might be understandably overlooked as inconsequential, the definition of what constitutes a researcher is extremely narrow, and many users who would be considered academics by the definition used in this thesis are likely lost in the other classifications.

A study by Goldman and Schaller examining the users of four websites[*] from very different museums discusses this problematic blurring of classifications in the very

[93] Dunmore, 106-107.
[94] Ibid.,106-107.
[*] The survey used in this study was distributed to six websites, but the results from two were not included in the final analysis due to low response rates.

relevant context of the label 'student'. The authors note that "…people in every age category, including over half of those over the age of 65, described themselves as students", and hence that this category captured both the desired primary and secondary level pupils as well as others such as "…graduate students and/or those taking non-degree-seeking community classes…".[95] A full 12 percent of the participants in their survey were between the ages of nineteen and twenty-nine, meaning that a significant portion of the 54 percent of users who identified themselves as students would likely fit under this paper's definition of academic researchers.[96] A similar argument can be made for the nearly 24 percent of respondents who identified themselves as teachers, since faculty members are nearly invariably teachers.[97] Perhaps the most reliable result of this study is therefore that an average of 20 percent of participants stated their visit to the museum website was to find information about objects in the collection, with two of the museums having over 25 percent of responses in this category, results far above the alternative options of completing a teacher-assigned project or seeking teaching resources, each of which had about 14 percent on average.[98]

Another study on the physical, remote (by mail, phone or email), and digital visitors to the Science Museum in London by Booth showed an uneven distribution of access by scholars.[99] The author concluded that of those actually coming to the building, only "…a small percentage (estimated at less than 10%) have either a professional or

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[95] Kate Haley Goldman and David Schaller, "Exploring Motivational Factors and Visitor Satisfaction in On-Line Museum Visits", Paper, *Museums and the Web*, Toronto: 2004, http://www.museumsandtheweb.com/mw2004/papers/haleyGoldman/haleyGoldman.html (accessed February 10, 2013), 'Results and Analysis', para. 1.

[96] Goldman and Schaller, 'Results and Analysis', table 2.

[97] Ibid., 'Results and Analysis', table 1.

[98] Ibid., 'Results and Analysis', table 6.

[99] Ben Booth, "Understanding the Information Needs of Visitors to Museums", *Museum Management and Curatorship* 17, no. 2 (1998): 139-157, EBSCO (accessed November 10, 2013).

specialist interest".[100] There was, however, a larger representation of researchers making remote access, with "around 20%..." of technical questions being "…of a specialist nature…".[101] The data was collected by survey for the physical and remote users, but by an analysis of the number of pages accessed for virtual visitors, and thus there was less exact information on the nature of online users.[102] It was observed, however, that digital visitors "…like to browse the galleries, to see images of objects, and find out about those objects and related information", certainly not ruling out the presence of researchers among the twenty-three thousand recorded visits.[103]

Part of the research conducted by Skov and Ingwersen, which later formed the basis of Skov's PhD dissertation, involved an online questionnaire of visitors to the website of the Danish National Museum of Military History.[104] The focus of the study was on the "…interactive information seeking and retrieval behavior…" of users visiting the museum website specifically "…in a leisure context".[105] In the initial report, released in 2008, 83 percent of respondents fit this criterion, while the final number discussed in Skov's dissertation had dropped to 67 percent.[106] The character of the inverse 17 and 33 percent of respondents respectively is not disclosed, but they are presumably composed of researchers, educators, students, and museum professionals since these are the major constituents appearing in all of the other studies. Since the collection included online by

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[100] Booth, 154.
[101] Ibid., 152.
[102] Ibid., 139; 145.
[103] Ibid., 153.
[104] Mette Skov and Peter Ingwersen, "Exploring Information Seeking Behaviour in a Digital Museum Context", in *Proceedings of the Second International Symposium on Information Interaction in Context*, eds. Pia Borlund, Jesper W. Schneider, Mounia Lalmas, Anastasios Tombros, John Feather, Diane Kelly, and Arjen P. de Vries (New York: ACM, 2008), EBSCO (accessed November 10, 2013); Mette Skov, "The Reinvented Museum: Exploring Information Seeking Behaviour in a Digital Museum Context" PhD diss., Royal School of Library and Information Science, Denmark, 2009), http://pure.iva.dk/ws/files/30768221/MetteSkovThesis.pdf (accessed November 10, 2013).
[105] Skov and Ingwersen, 110; Skov 108.
[106] Skov and Ingwersen, 111; Skov 108.

the museum in question is highly specialized, however, and Skov and Ingwersen's results demonstrate a high proportion of users with 'extensive' background knowledge (31 percent) and a tendency to search for specific artefacts and information (44 percent), researchers may form a larger proportion of these percentages.[107]

One of the earliest studies specifically on digital visitors, first reported by Sarraf, compared the traits of museum website users to internet users in general.[108] Several of the results suggest scholars were a significant group, including the education level of respondents, which showed over 10 percent having a PhD, and "…one-half holding a college degree or more…".[109] More directly, 18 percent of respondents listed 'seeking research information' as "…the benefit of them accessing a museum Website…".[110] This is tempered somewhat by the proportion of users who were museum employees (27 percent), who might be 'seeking research information' for professional reasons, not scholarly ones, but another combined 30 percent of respondents listed themselves as teachers or students. As in Goldman and Schaller's study, most of the students at least were logically at a university level, as only 10 percent of users were under twenty-one years of age.[111] In sum this study, as with most others, does not provide clear enough options to distinguish scholarly researchers from curatorial staff, educators or non-post secondary students, and while an academic audience is undoubtedly present it is difficult to quantify exactly what percentage they represent.

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[107] Skov and Ingwersen, 113.

[108] Suzanne Sarraf, "A Survey of Museums on the Web: Who Uses Museum Websites?", *Curator* 42, no. 3 (1999): 231-243, EBSCO (accessed November 10, 2013).

[109] Sarraf, Museum Website User Survey, para. 19.

[110] Ibid., Museum Website User Survey, para. 15.

[111] Ibid., Museum Website User Survey, para. 20; table 6.

The final two studies to be discussed are both much more recent examples conducted by Marty. The first surveyed twelve hundred online visitors to nine different museum websites with the research question "what role do digital museum resources play in the lives of museum visitors?".[112] Most of the topics covered look specifically at visitors from the general public, and asked questions such as whether they were likely to take maps or flyers or whether they would use the website to find admission pricing, but one result in particular is of interest for this discussion.[113] Respondents were asked to rank on a Likert scale how likely they were to access online research materials from museums in their daily life. Over 30 percent replied with 'very likely' while another 30 percent said 'likely'.[114] Without any questions designed to classify the users as, for example, researchers or educators, there is little that can be concluded from this finding, but in combination with results from Marty's other study a pattern is strongly suggested.

The second research analysis looked at users of the 'personal digital collections systems' of six museum websites.[115] These systems typically allow visitors to bookmark and annotate object records on their own personal page. This is the only study that specifically sets out 'researcher' as a category of user equal to 'visitor', 'teacher', 'student', and 'professional', and 10 percent of respondents chose this option, though it can again be argued that any number of post secondary degree candidates might have identified themselves as students despite having research intentions.[116] Supporting this

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[112] Paul F. Marty, "Museum Website and Museum Visitors: Digital Museum Resources and Their Use", *Museum Management and Curatorship* 23, no. 1 (2008): 81-99, EBSCO (accessed November 10, 2013), 84.

[113] Marty, "Museum Website and Museum Visitors", 86.

[114] Ibid., 89.

[115] Paul F. Marty, "My Lost Museum: User Expectation and Motivations for Creating Personal Digital Collection on Museum Websites", *Library & Information Science Research* 33 (2011): 211-219, EBSCO (accessed November 10, 2013).

[116] Marty, "My Lost Museum", 214.

supposition, the other notable result of this study was another Likert scale question asking how likely visitors were to use the personal collections for "researching artifacts for scholarly purposes". The responses included 37 percent 'very likely' and 30 percent 'likely', numbers very comparable to the similar results of the other study, and indicating that researchers could represent over two-thirds of all visitors to the websites studied.[117]

Reflecting on the results of all these studies in combination, it is possible to form a rough estimate of the traffic on museum websites attributable to scholarly researchers. I would argue that the minimum average proportion is 10 percent, based primarily on the response to the classification question of the last study discussed, which was the most direct assessment, but supported by most of the other studies. An upper extreme is more difficult to determine, but considering that many or most of those users categorized as 'students' may have been in post-secondary education, and thus have information requirements closer to a scholar than to a primary or secondary school student, I would deem as much as 25 percent to be possible depending on the museum. Even at 10 percent, however, academic researchers are a substantial enough user group that museum websites should be striving to meet their needs as well as those of more general visitors.

While academic scholars are just one of many groups that use museums and their websites, they are a group with a unique set of information requirements that must be acknowledged. Particularly key is the need for access to the raw data in museum records, specifically that useful for research purposes, rather than the slough of other tasks completed by the museum professionals to whom scholars are often compared. This user group has been disregarded by much of the literature in the field, however, as being too diminutive for importance, and although quantifying the audience is complicated by their

[117] Ibid., 216.

frequent double role as students or teachers as well as researchers, numerous studies of museum users suggest that they represent at least 10 percent of the audience of these institutions. In an attempt to begin assessing the information-seeking behaviour and information needs of this group, the remainder of this thesis will present the methodology, results and analysis of a preliminary study of this user group, as well as an assessment of how well current museum websites are meeting these needs and recommendations of where they might most be improved.

Chapter 3 – Scope, Definitions and Methodology

Having established the current state of museums and museum user studies in chapters 1 and 2, the remainder of this thesis will describe the research conducted in order to establish the information needs and information-seeking behaviour (ISB) of a specific group of scholars and determine how museum websites can better serve this population. This chapter will define the studies conducted, in terms of the underlying research questions, the scope of the user population and institutions included, and the meaning of key concepts. It will then describe and justify the methodology used to gather data and analyze the results. The analyses themselves, as well as the resulting recommendations and conclusions, will be presented in subsequent chapters. This research has been designed to balance breadth and depth of understanding regarding scholars' requirements of museum websites given the limited existing information on the subject. The results indicate several priority areas in which museum websites should be improved, as well as providing numerous starting points for future research.

3.1 Research Questions

This thesis seeks to better understand how scholars remotely discover and study the objects housed in museums, and thereby to enable these institutions to enhance the usefulness of their websites as resources for this population. In order to meet this goal, there are several aspects of scholars' information needs, ISB, and interface design preferences that must be explored. The specific questions behind this research can be grouped into the following areas:

- Which websites are scholars using to research artefacts? Are there specific factors that make them better resources?

- How do scholars locate relevant records on a museum website? Do they know what they are looking for in advance? Do they find records by searching, browsing, or both? Which traits do they search or browse by?
- Which types of metadata do scholars need in artefact records? Are particular fields more vital than others? What level of detail is needed in the metadata? Can textual metadata replace visual metadata, or vice versa?
- Are there specific data presentations that lend themselves to the intended uses of the information? Do scholars examine artefacts singularly or in comparison? Would key metadata be better presented graphically?
- How well are museum websites currently meeting the requirements of scholars? Does their information architecture support record location? Is the metadata provided rich enough? How could they be improved to better serve academic researchers?

By assessing these questions, a better awareness of the way scholars use artefact records and museum websites can be gained. Through understanding the activities and expectations of this population, these digital resources can then be modified to be of greater use.

There are several other matters related to this area of study that, while worth examining in future research, are not part of the present thesis. One such topic is the number of museums that still do not offer metadata for any or all of their holdings online. In smaller institutions this may be due to a lack of resources, but in many museums it is based on a fear that putting records on their websites will drive down visitors and cause a

loss of "…economic control over their intellectual property…".[118] It is a presupposition of this paper that making all records available digitally, what Dunmore suggests is the third phase on the "evolutionary scale" of museum web use, is a requisite step before the quality of those records can be assessed.[119] As discussed in Chapter 1, scholars have been clear in their desire for full access to collections and have critiqued the websites of institutions that do not include comprehensive records, and thus the necessity of providing such information online will not be reestablished.[120] Another area that will not be directly examined is the usability of museum websites in terms of user experience and design principles, though as seen in Chapter 4 this theme did arise naturally in some responses to the study. There are enough existing guidelines in this area, including reports specific to museum websites, that it need not be discussed here.[121] In addition, any assessment would be best accomplished on a case-by-case basis through user testing, and the results of such would not be widely applicable, which is against the purpose of this thesis.

3.2 Scope of Research

While the under-consideration of academic researchers by museums and museum studies literature spans across all collections and levels of scholars, the limited time and resources available to complete this research necessitated a narrowing in the type of

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[118] Enrico Bertacchini and Federico Morando, "The Future of Museums in the Digital Age: New Models for Access to and Use of Digital Collections", *International Journal of Arts Management* 15, no.2 (2013): 60-72, EBSCO (accessed November 29, 2013), 60.

[119] Dunmore, 103.

[120] Diaz and Egido, 38; Hoopes, 93.

[121] Elisangela Vilar, Ernesto Filgueiras, and Francisco Rebelo, "Methodology to Apply a Usability Testing by Non Specialized People: Evaluation of the European Platform 'e-Exhibitions'", in *Ergonomics and Health Aspects of Work with Computers: International Conference, EHAWC 2007, Held as Part of HCI International 2007, Beijing, China, July 22-27, 2007 Proceedings* (Berlin: Springer Berlin Heidelberg, 2007), 359-367; Daniel Cunliffe, Efmorphia Kritou, and Douglas Tudhope, "Usability Evaluation for Museum Websites", *Museum Management and Curatorship* 19, no. 3 (2001): 229-252, EBSCO (accessed November 10, 2013).

institution and the user group studied. This section will explain the scope of this thesis with regard to these two aspects.

3.2.1 Institutions and Collections

In terms of the museums themselves, the variety in the collections, intentions and audience between institutions or between departments in large institutions creates too much disparity for universal standards to be successful. The focus in this research will thus be on a single type of collection, Classical antiquities, in the cultural heritage branch of museums. These institutions sit in the middle of the spectrum of departmental similarity, on which fine art collections at one extreme are fairly uniform, and the departments of natural history museums at the other are entirely distinct.[122] In cultural heritage institutions, each department has a unique set of needs, but there are also themes, for example place of production, that are universal. Focusing on a single collection type will thus allow the research to be manageably sized while still having generalizable properties. In addition to being an area with which the author is familiar, providing a solid starting point for the research, Classical antiquities were among the first objects to be collected and studied, and there is a well-established tradition among scholars as to their use, meaning that potential academic users are likely to have clear expectations regarding the representation of objects online.

For the purposes of this paper, Classical antiquities are considered to be anything created in a location under Greek or Roman control at the time they were made. This includes geographically much of Europe, the Middle East, and northern Africa, and spans temporally from 7000BCE, the beginning of the Neolithic era in Greece, to 476CE, the

[122] Jim Blackaby and Beth Sandore, "Building Integrated Museum Information Retrieval Systems: Practical Approaches to Data Organization and Access", *Archives and Museum Informatics* 11 (1997): 117-146, EBSCO (accessed November 10, 2013), 120.

traditional date of the fall of Rome.[123] It excludes artefacts produced under the Byzantine Empire that succeeded the eastern half of the Roman Empire. In terms of the objects themselves, collections might include any combination of artwork, tools, coins, vessels, personal items, and even entire buildings depending on the museum. Classical antiquities might comprise the entire collection, a single department, or be intermixed with other items outside of the scope described above. Since the focus in this research is on the users of the artefacts, and not the museums that contain them, there has been no attempt to define the institutions any more precisely than this.

3.2.2 Participants

Another significant narrowing in the scope of this thesis is in relation to the group of users being studied. First, the study was limited to scholars who currently use Classical material culture as primary evidence, as this group was more likely to have an opinion about the subject at hand, though a valuable future study might examine why many researchers do not use such objects and how they might be encouraged to do so. A further reduction in the study population was to include only a single level of academic researcher. Despite the description provided in the previous chapter of what constitutes an academic museum user, numerous studies from LIS have shown that, just as with the general public, the information needs and ISB of scholarly sub-groups can vary

[123] Edward Gibbon, *The History of the Decline and Fall of the Roman Empire* (1776-1789), abridged, ed. William Smith (New York: Harper and Brothers, 1857), Chapter XVIII.

significantly.[124] Considering this diversity, it was impractical to examine more than one of these sub-groups in this research. The audience selected for study was doctorate holders, a decision made both for reasons of candidate recruitment, as discussed below, and because unlike undergraduate and graduate students who have been shown to have ever-changing levels of subject awareness and information-seeking strategies as they progress through their studies, the familiarity with a narrow topic possessed by those who have earned a PhD tends to result in higher stability, and thus a greater capacity to reflect on their information needs.[125] While the rest of this thesis will refer to the study population as 'scholars', the term should be understood to mean this diminutive subset of that group.

3.3 Definitions

The three key concepts in this research, ISB, metadata, and interface design, are very broad topics that have been defined differently between disciplines and between authors. In this section I will thus describe the way in which these terms are used in this thesis in order to prevent confusion.

3.3.1 Information-Seeking Behaviour

There are several ways in which ISB has been examined in LIS and museum studies literature. In the Getty Online Searching Project, for example, which assessed the

[124] Andy Barrett, "The Information-Seeking Habits of Graduate Student Researchers in the Humanities", *The Journal of Academic Librarianship* 31, no. 4 (2005): 324-331, EBSCO (accessed March 22, 2014); Hsin-Yih Shyu and Kang-Jiun Pern, "The Comparison Study of Factors Influencing Information Behaviors between Undergraduate Students and Teachers in University", *Journal of Educational and Library Sciences* 50, no. 3 (2013): 393-423, EBSCO (accessed March 22, 2014); Mahmood Khosrowjerdi and Mohammad Iranshahi, "Prior Knowledge and Information-Seeking Behavior of PhD and MA Students", *Library and Information Science Research* 33 (2011): 331-335, EBSCO (accessed March 22, 2014).

[125] Barret, 328-330; Joanne E. Callivan, "Information-Seeking Behaviour of Undergraduate Biology Students: A Comparative Analysis of First Year and Final Year Students in University College Dublin", *Library Review* 54, no. 2 (2005): 86-99, EBSCO (accessed November 13, 2013).

use of an early electronic database by humanists, it was defined by the minutia of the terminology and logic used in their search queries, as evidenced in several of the published reports.[126] Alternatively, there have been numerous studies and theories that focus on the combinations of activities being performed by users, such as searching, browsing, viewing and re-finding, as the important factor.[127] Yet another method of studying ISB used by some researchers is to investigate the motivations of users for accessing a resource, for instance 'to complete an assignment' or 'to plan a trip'.[128] In recognition of the broad nature of this preliminary research, aspects of all these approaches have been included in the study in order to provide a rough sketch of the scholar's ISB as a whole and to provide multiple starting points for future research.

3.3.2 Metadata

Another core consideration in this study is the metadata used to describe museum artefacts online, which is not only directly related to the information users need about an object, but also affects matters of ISB and interface design by defining what functionality is possible on a website. In this research the very broad concept of metadata will be defined using the categories discussed by Baca et al. The authors outline three types of standards common in LIS: structure standards such as Dublin Core and CDWA, which dictate the fields that should exist in a record; content standards like the Anglo-American

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[126] Marcia J. Bates, Deborah N. Wilde, and Susan Siegfried, "An Analysis of Search Terminology Used by Humanities Scholars: The Getty Online Searching Project Report Number 1", *The Library Quarterly* 63, no. 1 (1993): 1-39, JSTOR (accessed April 24, 2013); Susan Siegfried, Marcia J. Bates, and Deborah N. Wilde, "A Profile of End-User Searching Behaviour by Humanities Scholars: The Getty Online Searching Project Report No. 2", *Journal of the American Society for Information Science* 44, no. 5 (1993): 273-291, EBSCO (accessed November 10, 2013); Bates, "The Design of Databases and Other Information Resources for Humanities Scholars".

[127] Dunmore; Skov and Ingwersen,; Marcia J. Bates, "The Design of Browsing and Berrypicking Techniques for the Online Search Interface", *Online Review* 13, no. 5 (1989), http://pages.gseis.ucla.edu/faculty/bates/berrypicking.html (accessed 16 October 2013); Peter Morville and Louis Rosenfeld, *Information Architecture for the World Wide Web*, third edition (Farnham: O'Reilly, 2007), 30-38.

[128] Booth; Goldman and Schaller.

Cataloguing Rules and CCO that offer guidelines for what information should be included in each field and how it should be formatted; and value standards, including the Library of Congress Subject Headings and AAT, which control the terminology that can be used to fill the fields. [129] The primary focus in this thesis will be on structural metadata, though there will be a limited discussion of content and value metadata as well.

Another significant definition of metadata as it will be used for this research is related to the granularity at which it is applied. It has long been a flaw of the databases used in museums that the fields required are assumed to be uniform across all items, a result of the systems being designed and built commercially or by computer scientists who have no experience in museums.[130] The approach taken here instead identifies three levels of structural metadata at which fields might change depending on the item being recorded. The first is a museum-wide level that includes general fields such as current location, condition, or date of acquisition that would apply universally. The second is a collection-specific level in which the fields would vary significantly between art and geology departments, for example, but would be constant within a single collection. For the Classical antiquities to be examined in this research, these fields would include date of production and creating culture, among others. The final level is object specific, meaning that the required metadata changes significantly from object type to object type, so that all coins might share fields, but these would differ substantially from the fields used to describe a pottery vessel. A complete record for any object should contain metadata for each of the three levels. While recognizing this hierarchy, however, the

[129] Murtha Baca, Erin Coburn, and Sally Hubbard, "Metadata and Museum Information", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 108.

[130] Chenhall and Vance, 4.

studies completed in this research consider primarily museum and collection levels of metadata, as there are too many permutations of the object-specific variety to be addressed in a paper of this length.

3.3.3 Interface Design

In general, the term interface can be applied to anything "…that is between two other parts or systems, and helps them communicate or interact with each other".[131] This includes physical input devices such as a mouse or keyboard in addition to displays, but the term is now most closely associated with Graphical User Interfaces (GUIs) and more precise divisions thereof, such as Search User Interfaces.[132] The concept of interface design for a GUI has been described by LIS and digital humanities scholars in several ways, including based on the affordances of the physical technology for human-computer interaction (HCI), as well as the role of aesthetics for enhancing perceived value of information.[133] As interface design is a relatively minor aspect of this research, included primarily because it is intertwined with other topics examined, no single definition has been adopted, but rather a few select components of graphic design and HCI have been used. One of these that is worth noting is what Ruecker et al. term "meaningful and efficient arrangement of visual elements", particularly pertaining to search result information. Beyond this, it is perhaps more important to define those aspects of interface design that are not being considered. These include both general principles, such as

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[131] Adriana de Souza e Silva and Jordan Frith, *Mobile interfaces in public spaces: locational privacy, control, and urban sociability* (New York: Routledge, 2012), 1-2.

[132] Silva and Frith, 2; Max L. Wilson, *Search User Interface Design* (San Rafael, CA: Morgan and Claypool, 2012).

[133] Lev Manovich, *The Language of New Media* (United States of America: MIT Press, 2001), http://www.manovich.net/LNM/Manovich.pdf (accessed May 31, 2014), 94-98; Stan Ruecker, Stéfan Sinclair, and Milena Radzikowska, *Visual Interface Design for Digital Cultural Heritage: A Guide to Rich-prospect Browsing* (Farnham, Surrey, England: Ashgate, 2011), EBSCO (accessed May 30, 2014), 12-16.

Nielsen's usability heuristics, as well as issues that are specific to a single system like navigation design.[134] Instead the focus is on aspects of interface design that relate directly to museum information, but are generalizable to any museum website.

With these definitions explained, the final sections of this chapter will describe the two studies completed in this research. For each, a brief review of similar studies will be provided, followed by a description of the methods used to gather and analyze data. The first study is a user survey examining how scholars access records on existing museum websites, and what metadata and functionality they require. Drawing on the results of this investigation, an evaluation of the most-used websites by study participants was also undertaken to determine if and how these resources provide the necessary information and features. After explaining how the studies were conducted, the subsequent chapters of this thesis will relate an analysis of the results, and the conclusions drawn from them.

3.4 User Survey Methodology

3.4.1 Methods of Comparable Studies

Although it has been noted that less investigation has been done into virtual museum visitors than in-person ones, there are still three distinct methodologies that have been employed to study users of museum websites.[135] The first of these is to gather data on visitors actions discretely using website analytics, and to adjust the design based on trends in the traffic.[136] Although this methodology is fast and ensures a large sample size,

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[134] Jakob Nielsen, "10 Usability Heuristics for User Interface Design" (1995), *Nielsen Norman Group*, http://www.nngroup.com/articles/ten-usability-heuristics/ (accessed May 31, 2014).

[135] Kirsten Ellenbogen, John Falk, and Kate Haley Goldman, "Understanding the Motivations of Museum Audiences", in *Museum Informatics: People, Information, and Technology in Museums*, eds. Paul F. Marty and Katherine Burton Jones (New York: Routledge, 2008), 192.

[136] Booth, 145-146; Henk Voorbij, "The Use of Web Statistics in Cultural Heritage Institutions", *Performance Measurements and Metrics* 11, no. 3 (2010): 266-279, EBSCO (accessed April 7, 2014).

it is also challenging to identify a specific sub-group within the website visitors and has been criticized because "making the connection between observed behaviour and the reasons underlying that behaviour is difficult, particularly where there is no additional information".[137] Perhaps the most utilized approach to studying virtual museum users is to focus on a single or small group of institutions and offer an online survey to all visitors.[138] This method can be somewhat more qualitative than pure analytics, but there is still difficulty distinguishing between user groups in the results and, depending on the study design, there is limited application of the conclusions beyond to the included museums. The final methodology, which has been less used in museum studies, but which has been drawn on for this research, is investigate a group of users independently of any particular institution.[139] Though candidate identification is more of a concern in this approach, it allows a specific audience to be targeted and was thus considered the most appropriate for the research questions behind this thesis as outlined above.

3.4.2 Data Collection Methods

As discussed above, the user group examined in this study was doctorate-holding scholars with demonstrated experience in using Classical antiquities as primary evidence in their research, whether generally or limited to a specific type of artefact such as coins. Candidates for participation were identified based on the self-identified topics of interest listed in their faculty website profiles, as well as by the content of their publications. In

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[137] Cunliffe, Kritou, and Tudhope, 233.

[138] Goldman and Schaller; Marty, "Museum Websites and Museum Visitors: Digital Museum Resources and Their Use"; Marty, "My Lost Museum: User Expectation and Motivations for Creating Personal Digital Collection on Museum Websites"; Skov and Ingwersen; Jim Ockuly, "What Clicks? An Interim Report On Audience Research", Paper, *Museums and the Web*, Toronto: 2003, http://www.museumsandtheweb.com/mw2003/papers/ockuly/ockuly.html (accessed February 10, 2013).

[139] Amin et al.; Chern Li Liew, "Online Cultural Heritage Exhibitions: A Survey of Information Retrieval Features", *Program: Electronic Library and Information Systems* 39, no. 1 (2005): 4-24, EBSCO (accessed November 10, 2013).

total, twenty-five potential participants were identified from seven major institutions across Canada: the University of British Columbia, the University of Alberta, the University of Calgary, the University of Saskatchewan, the University of Western Ontario, the University of Toronto, and McMaster University. The departments represented include History and Classics, Art History, Archaeology, and Greek and Roman Studies.

The study itself was an online survey analyzed using a mixed-methods approach. Although the questions underlying this research, many of which examine behaviours and preferences, are ultimately qualitative in nature, this methodology was chosen over the alternative of interviews for two reasons: the time and resources available would have made interviewing a sufficient number of participants scattered across the country impractical; and the dearth of existing information on scholarly users of museums made formulating purely open-ended questions problematic. Rather than using commercial options, the survey system was purpose-built by the author on University of Alberta servers for reasons of cost, customizability, and to avoid having the responses subject to the US PATRIOT Act as a result of being stored on an American server. A link to the survey, along with a letter of introduction and ethics information, was distributed to candidates by email, with reminders sent two, three and four weeks after the initial contact. An option was given on the consent page to decline to participate and thus stop receiving the reminders. The distribution and data collection took place from September to November 2013 in three phases: a pilot study with four candidates from a single university, a full scale study with an additional fifteen candidates from four universities,

and an expansion which added six more candidates from two universities in an attempt to increase the total number of participants.

In total, nineteen of the twenty-five candidates contacted for the study participated, giving a 76 percent response rate. As an ethical consideration, however, respondents were given the option to skip any of the questions they chose, meaning that some queries have fewer than nineteen answers. In fact, three participants submitted the survey after completing only the first few questions, and while the answers provided were included in the analysis, the effective number of responses for most of the survey was therefore sixteen, or 64 percent. This sample size was deemed to be sufficient for a preliminary study such as this, and avoided the added complication of seeking ethics clearance for international locations.

The survey itself consisted of twenty-five questions: twenty-one closed-answer, including dichotomous, multiple choice, 'choose all that apply', ranking, and Likert scale style responses; and four open-answer with no limit to the length of the replies. The options provided for the closed-answer queries were compiled primarily from those offered on museum websites, but some were also drawn from the records and systems of the Kastro Kallithea Archaeological Project, a Greek excavation that is co-supervised by faculty members from the History and Classics department at the University of Alberta. For example, in question sixteen (see Appendix A), the options of Significant Characteristics, Object Type, Material Color and Material Type, as well as the distinction between levels of Location of Discovery were based on the records used at this excavation. The design of all the questions was meant to keep the survey short enough to encourage participation, while also covering the key issues of scholars' information needs

and information-seeking behaviour in as much depth as possible. A complete recreation of the survey is available in Appendix A, but the following is a summary of the study. Although there is overlap between areas, for clarity the questions have been grouped topically into five categories.

The first three queries were demographic in nature, and were designed to establish how much variety there was in the research interests of responding participants. They looked at the respondents' fields of study, the types of artefacts they had used, for example coins or pottery, and the geographical areas and temporal periods they researched. Since the purpose of these questions was simply to determine the level of diversity, the possible answers provided were broad but not exhaustive lists, and a fillable 'other' option was given for each.

The next category of questions was the largest with eight queries, and addressed issues related to information-seeking behavior. Two of these, numbers four and five, established if the respondent had previously accessed artefacts digitally, and, dependent on their response, either which online resources they had found helpful or the reasons they had not done so. After the pilot study results showed a low response rate for the positive option, the wording was changed to simplify the question and thus encourage participants to answer, though the meaning of the query remained the same. Question six originally asked respondents to outline their procedure for locating artefacts, but the pilot study showed extensive confusion, including one participant who directly stated that they did not understand the question. As a result of this reaction, the question was changed in the full and supplemental studies to enquire what the intentions of participants were when they searched for objects, an issue raised inadvertently during the pilot study by the

response "…artefacts understood by comparanda from other sites". The remaining questions in this category, numbers nine through thirteen, examined respectively whether the participants were more likely to search or browse, what organizational schemas they would expect if browsing, which search fields they would use, how many search criteria they would enter for a single query, and the type of terminology they were likely to use in searches.

The third group, including seven questions, explored the metadata requirements of participants. Questions sixteen and twenty addressed the information included in artefact records, both in terms of what should ideally be included and what most often was not. Number seventeen looked at whether related items should be described individually or collectively. Finally, questions twenty-one through twenty-four assessed whether images were a necessary part of online records, whether the subject of those images should be general shots or details, whether measurement scales should be included in the pictures, and whether the ability to reproduce images from the website in publications would be useful for the participant's research. The latter topic is more related to museum policy than to website functionality, but it is a partner issue to the questions regarding the importance of images in artefact records and was thus considered worth including.

The next category, also consisting of six questions, examined three aspects of interface design, specifically related to how information is best presented. Questions seven and eight assessed if and how participants preferred to enter search terms involving non-Roman alphabets. Numbers fourteen and fifteen investigated how search result and record pages should be arranged, the latter question set up as a ranking question that purposefully allowed participants to indicate that multiple options were the most or least

useful. The remaining questions, eighteen and nineteen, addressed the usefulness of information outside of the raw metadata, including contextual materials and data visualizations. In combination these three areas suggest what the website information should look like, not just what it should entail.

The final question, comprising its own category, was an open forum for any additional comments that participants might have. This was an attempt to gather data on any matters of particular import not covered elsewhere in the survey.

3.4.3 Data Analysis Methods

The analysis of the survey responses, as presented in the next chapter, was performed in a combination of ways. Quantitatively, most questions were processed statistically to produce averages and modes, but a concerted effort was made to also examine each answer individually and along demographic lines to uncover any relevant trends or anomalies. The open-answer questions were also treated qualitatively with the application of simple grounded theory coding schemas as described by Strauss to unveil predominant themes.[140] This mixed-methods approach was designed to balance generalizations with the inherently individual nature of a scholar's research process to create a more complete understanding of the issue. As the calculations completed were fairly simple, and there were few enough responses to the open-answer questions to code by hand, no advanced tools or software was necessary for data analysis beyond a word processor and a spreadsheet program. The conclusions drawn from this analysis, in addition to informing the recommendations provided in Chapter 6, were also used to design the second study described below.

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[140] Anselm L. Strauss, *Qualitative analysis for social scientists* (Cambridge; New York: Cambridge University Press, 1987), 55-81.

3.5 Website Assessment Methodology

3.5.1 Methods of Comparable Studies

A traditional method for analyzing websites is to evaluate them against a checklist of expected features. There are examples of this using both a very complex and a very simple set of criteria. Lazarinis, for example, focused exclusively on the presence and type of search engine on museum websites, but examined ninety institutions in the study.[141] Other authors, meanwhile, have employed far more complex checklists with multiple dimensions and sub-dimensions examining many facets of a website's design, but applied this rubric to far fewer museums, for example sixteen in the case of Wallace and seven in Dyson and Moran's research.[142] Whichever approach is taken, this methodology allows the focus to remain precisely on factors of import to the study, but also risks missing or not recording significant components of the websites because they were not included on the pre-populated list.

A slightly different methodology was used by Liew to study the websites of fifteen LAMs. Rather than compiling a structured list of criteria, she catalogued the "…characteristics and features of current major initiatives…" as they were present.[143] This approach evaluated the websites more holistically, capturing notable features without needing to predict them, but the results from each site are less comparable than

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[141] Fotis Lazarinis, "Exploring the Effectiveness of Information Searching Tools on Greek Museum Websites", Museum Management and Curatorship 26, no. 4 (2011): 391-408, EBSCO (accessed November 10, 2013), 393-398.

[142] David A. Wallace, "Museums on the World Wide Web: A Survey and Analysis of Sixteen Institutions", *Archives and Museum Informatics* 9, no. 4 (1995): 388-424, EBSCO (accessed November 10, 2013); Mary C. Dyson and Kevin Moran, "Informing the Design of Web Interfaces to Museum Collections", *Museum Management and Curatorship* 18, no. 4 (2000): 391-406, EBSCO (accessed November 10, 2013).

[143] Liew, 7.

the alternative method described above. Aspects of both of these methodologies have been incorporated into this study in order to balance the benefits of each.

3.5.2 Data Collection Methods

For this research, ten museum websites were assessed to provide an indication of how well they are meeting the needs of scholars as indicated by the results of the user study discussed above. The conditions for candidacy were that the museum be in North America, that its collection include Classical antiquities, that the collection records be available online, and that those records be searchable. There are over five thousand museums throughout Canada and the United States, but no proper index of these exists, making identifying those that house Classical materials difficult.[144] A list of potential institutions was thus compiled from the categorized guide prepared by an online art magazine and supplemented with those museums listed by user study participants (see Chapter 4) and those known to the author.[145] From this, numerous websites were eliminated because their records are not available online, including the Royal Ontario Museum, the Harvard Semetic Museum, and the Museum of Classical Antiquities at the University of Ottawa. An additional few organizations, such as the Museum of Antiquities at the University of Saskatchewan, were excluded because there is no search system on the website to query records. The final list of institutions, as summarized in Table 3.1, was selected to maximize diversity in terms of the size, nature, location and audience of the institutions.

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[144] The American Alliance of Museum lists over 3,600 member institutions nationally (*American Alliance of Museums*, "Find a Member Museum", http://www.aam-us.org/about-museums/find-a-museum (accessed July 3, 2014)); the Canadian Museum Association has over 2000 member organizations (*Canadian Museum Association*, "About CMA", http://www.museums.ca/About/?n=12 (accessed July 3, 2014)).

[145] TheArtWolf.com, "Art Museums – Antiquities", *Art Museums by Category*, http://www.theartwolf.com/galleries/museums-genre-antiquities.htm (accessed June 12, 2014).

The collection size of these institutions was based on the number of Classical antiquities they house, not the total number of objects, with under five hundred being considered small, five hundred to five thousand medium, and over five thousand large. The nature of these artefacts was also examined to see if they were a general balance of materials, or were predominantly or exclusively of specific types. The audience of the museums was inferred from their mission statements, funding sources, and parent organizations. The diversity between the included institutions in terms of these factors allows variables that may affect a website's suitability for scholars to be isolated when considering the results of the study.

Table 3.1: List of Evaluated Museums

Name	Location	Primary Audience	Materials	Collection Size	Listed by Participants
American Numismatic Society	New York, NY	Scholars	Coins	L	Y
Brooklyn Museum	Brooklyn, NY	Public	General	M	N
The Cleveland Museum of Art	Cleveland, OH	Public	General	S	N
The J. Paul Getty Museum	Los Angeles, CA	Public	General	M	N
Kimbell Art Museum	Fort Worth, TX	Public	Statues; Vessels	S	N
McMaster Museum of Art	Hamilton, ON	Scholars	Vessels	S	Y
Metropolitan Museum of Art	New York, NY	Public	General	L	Y
Museum of Anthropology	Vancouver, BC	Scholars	General	S	N
Museum of Fine Arts	Boston, MA	Public	General	L	N
The Walters Art Museum	Baltimore, MD	Public	General	M	N

Drawing on the results of the user study described above, a list of twenty-three criteria was developed to assess these museum websites on their information retrieval functions, artefact records, interface design, and additional features. The sites were evaluated on whether they possessed certain traits, for example the ability to enter foreign alphabets into search fields, and what such features entailed or how they worked. The

complete rubric employed is available in Appendix B, but a summary of the criteria was as follows.

The first section examines issues related to information retrieval of records on the website. It checks for the presence of each search field and browsing category included in the user survey, listed in decreasing order of importance as indicated by the study responses, and notes any others available that are relevant to scholarly research. It also determines whether browsing is single level, hierarchical, or faceted. As it can be difficult to distinguish between search and browse functions, particularly in the case of faceted browsing, search fields were considered to be those that could be entered in a single form and submitted at the same time, while any case where parameters were applied and reflected in the results one by one was counted as browsing. The refinement of search results, generally through browsing-style means, was covered as a feature in the interface section.

Three additional matters related to information retrieval were also covered. The first examines what facility, if any, allows non-Roman alphabets to be entered in to search fields. The next concerns the method for re-finding records, whether the site has implemented a personal collections as discussed by Marty, or the user must record artefact identification numbers to search by later.[146] The final aspect of information retrieval assessed is whether standard query parsing techniques are used, including any Boolean operators, for which OR or NOT in addition to AND is considered a positive; stop words, particularly for articles; truncation to broaden searches, for example 'Gree*' to include both Greek and Greece; and the use of a thesaurus, tested with a simple example of plural to single conversion.

[146] Marty, "My Lost Museum".

The second section considers the interfaces of the search results and individual records, as well as any additional data viewing options of the websites. The method of displaying multiple records was assessed on five criteria established using grounded theory as the evaluations progressed: the number of records per page and their layout; whether the objects are identified textually, visually or both; how much textual metadata is provided, if any; whether the results can be sorted and by what fields; and whether the results can be refined and by what fields. The individual records, as their content are evaluated in the item record section, were described in terms of how the textual metadata was displayed, how the visual metadata was displayed, and whether there were links to other searches, items, or related material. In addition, any capacity the sites have to compare, visualize, or contextualize records was also listed and briefly described as needed.

The next area evaluated in the rubric is the metadata included in artefact records, divided into textual descriptions, visual representations, and other related concerns. The written metadata is assessed simply on whether certain information is present or not, the list based predominantly on that included in the user study described above, and reflecting the order of importance determined therefrom, but several of the fields were modified to reflect how museums tend to use them. Specifically, creating culture was expanded to also include a creating person, while location of discovery was generalized to reflect the location of production as well. The presence of the fields in some of the records on a website is considered to represent an intention to include the metadata, and is thus marked as ‘yes’ even if it is not consistently available.

The matter of consistency is instead reflected in the later category, wherein ‘poor’ indicates that the presence or absence of fields is unpredictable, ‘adequate’ indicates fields are fairly stable, but the thoroughness of their contents changes, and ‘good’ indicates that a user can generally know what to expect from any given record on a site. A similar grading scheme is applied to the degree of data separation and data quality. For the former, having metadata fields buried in paragraphs is considered poor, having discrete pieces of information, most commonly dimensions, strung together in a field is adequate, and having all metadata partitioned is good. The data quality criteria is far more subjective, but is evaluated based on the thoroughness of the descriptions in fields that are present and the certainty with which the information provided can be trusted as authoritative. Related to these matters, the inclusion of references and the declared or evident use of a standard were also determined.

For the visual metadata criteria, meanwhile, a sample of records from each website was examined to establish an estimate of how many include zero, one, two and three or more photographs, how many have scales in at least one photograph, and how many completely represent the artefact being described. This latter factor was included to account for two considerations: first, that quantity of images does not equate to quality, meaning that six photographs taken from the same angle would score as 3+ in the basic count, but does not actually provide more information than a single image would; and second, that different types of objects require a different number of images to be adequately represented, for example a coin generally requires two photographs, while a vase may need six or more depending on the complexity of its shape and design. The

percentage of records with a 'complete' visual object representation is therefore a more accurate measure of the website's utility than a tally of the images.

The sample size used for each website in this part of the assessment was based on the size of the collection. Small museums had every record included, medium institutions had approximately five hundred, and most large museums had approximately two thousand items sampled, equating to at least 10 percent of the total number of items in both cases.* The American Numismatic Society website, however, which houses over 175,000 artefacts, had a sample size of five thousand records or about 3 percent of the total collection, a small sample but the largest amount that could reasonably be undertaken for this study. In order to maximize recall, the records were generally retrieved through the browsing system using the appropriate culture or department categories, and sampling evenly from the relevant departments when they were separate. For two websites where this was not possible, however, the J. Paul Getty Museum and the Museum of Fine Arts, the search queries 'Greek' and 'Roman' were used instead, and modern objects in the results were excluded. As the precise limits of the browsing categories differ between museums, in several cases artefacts of ancient Near Eastern and Egyptian origin were returned as well. In order to avoid biasing the sampling pool by applying additional limiters, these records were included as equivalent to Classical antiquities for the purposes of representing a museum's photography practices. Excluding small museums, for which the artefacts were simply worked through sequentially, the sample was taken from the unsorted results pages at even intervals calculate to produce the required number of records.

* The total number of records sampled varies slightly based on the number of records per page on each website.

Finally, a few additional criteria outside of the categories listed above were also examined. The first is checks the website's policies on reproducing images to determine whether they are copyrighted, open access, or unlisted. The ease of use of the websites was also judged subjectively, focusing primarily on navigation between search results and records, and the ability to produce good recall of records through search and browsing systems with a limited prior knowledge of the website. The last criterion is a list of any other notable features or functions that the websites contained not covered in the rest of the rubric, focusing on matters that could affect the research of scholars as indicated by the results of the survey.

3.5.3 Data Analysis Methods

After the ten websites were assessed using the checklist shown in Appendix B, the results were analyzed on both an individual and comparative basis. Individually, each website's rubric was evaluated to identify particular strengths and weaknesses, and to determine how distant the websites are from a hypothetical ideal, thus suggesting how well they are meeting the information needs of scholars. The checklists were then compared across all institutions and across similar institutions (see Table 3.1) to identify trends among criteria that scored well, indicating that museums are aware that the functionality should be included in their websites, and criteria that scored poorly, signifying that this is a high priority area for improvement. These analyses, presented in Chapter 5, contextualize the results of the user survey and allow the recommendations of the final chapter to reflect the current state of museum websites and refer to real world exemplars of good practices.

In combination, the two studies described above are designed to identify what academic researchers need from a museum website and to what degree this is currently being provided by such resources. The results of the user survey, as presented in the next chapter, provide a broad base of information on the ISB, metadata requirements, and interface preferences of scholars familiar with the use of museum artefacts in their research. The evaluations of relevant websites discussed in Chapter 5, meanwhile, demonstrate ways in which a sample of museums are and are not adequately serving this population. In the concluding chapter, both of these analyses will be drawn upon to create a tiered series of recommendations suggesting places where museum websites, regardless of their current level of sophistication, can be improved.

Chapter 4 – User Survey Analysis and Results

The following analysis presents the results of the user survey conducted as described in Chapter 3. Note that the survey system was designed to keep the responses entirely anonymous, and there was no connection between the participants' personal information and the answers received, therefore the participant numbers as used below were assigned sequentially as responses were submitted. In order to discuss related themes together, rather than listing them sequentially, the questions have been grouped into the categories demographic, information-seeking behaviour, metadata, interface design, and additional, with cross-references made as needed to demonstrate trends.

4.1 Participant Demographics

The responses to the demographic questions indicate that there was a reasonable variety among the participants' fields of interest, in terms of their disciplines, types of artefacts studied, and time periods and locations of focus. Visual breakdowns of the answers to the first three questions are shown in Figures 4.1, 4.2, and 4.3. Respondents were encouraged to choose as many categories as were applicable to their work, and most participants did, making the totals in these breakdowns significantly above nineteen. History and Classics as well as Archaeology were the two most well represented disciplines, which was a predictable result considering these are the areas most associated with Classical studies and material history respectively. Although five participants also identified Art History as an area of study, it should be noted that no respondent chose this discipline exclusively, and thus the representation of Fine Arts scholars in this study is tempered at best. The only 'other' category entered was Religious Studies, another field in the Humanities.

All of the common types of Classical artefacts were also represented, with pottery, architectural elements, statues, and coins being the most common answers. Six of the respondents chose all of the available categories, and two of these also chose 'other', answering variably with a generalization of "anything used in daily and religious life" and with a more specific breakdown of "manuscript illuminations; inscriptions; appliques; funerary art; clay seals; admission tokens".[147] Alternatively, three participants selected pottery as the only material objects they research, while 1 chose only coins.[148] This suggests there were a mixture of respondents who study Classical artefacts generally and who specialize in a specific type.

The chart in Figure 4.3 describing the time periods and locations the participants selected as areas they have studied attempts to show the information on two levels: The individual blocks represent each possible category provided, while the six sections of gradient colors collect these categories into temporally or geographically related sections. In the Greek stack, the aqua blocks represent different provinces during the Graeco-Roman period, the purple blocks provinces during the Hellenistic period, and the green blocks different time periods in Greece before the death of Alexander the Great. Similarly in the Roman stack, the red blocks represent provinces under the Imperial period, the blue blocks provinces under the Republic, and the orange block signifies the Etruscan culture that predates the foundation of Rome. As the chart demonstrates, researchers of Roman culture were slightly more prevalent than Greek, and the most studied sections were the

[147] Participants 1 & 2; Participant 4 chose pottery and listed "administrative texts" as an 'other' option, but the latter is a textual resource, not a material artefact and was not included in this consideration.

[148] Participants 4, 6, 11 & 18.

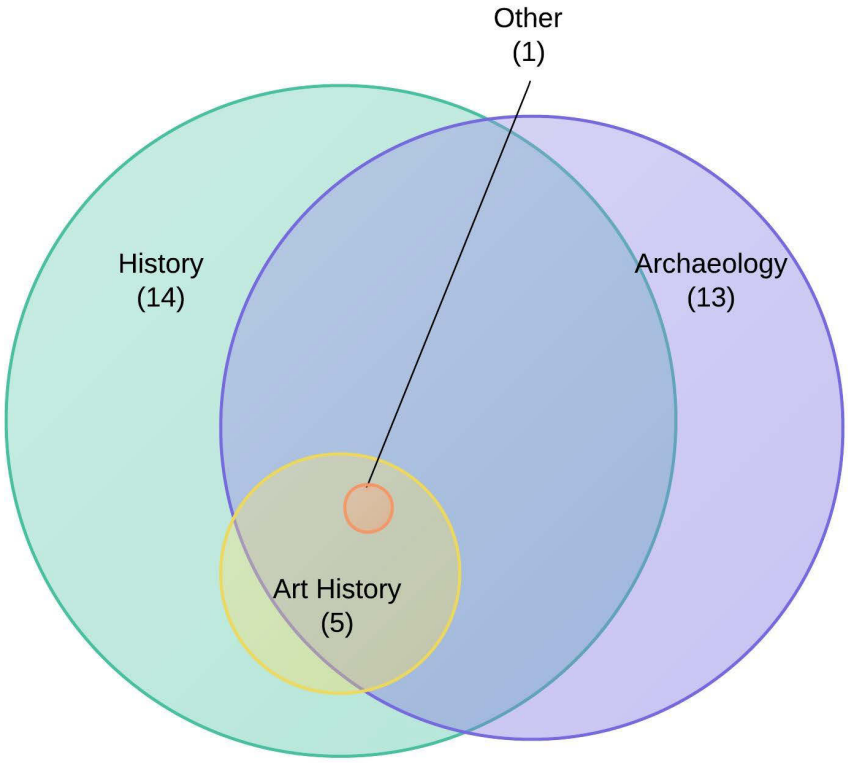

Figure 4.1: Breakdown of Participants' Disciplines

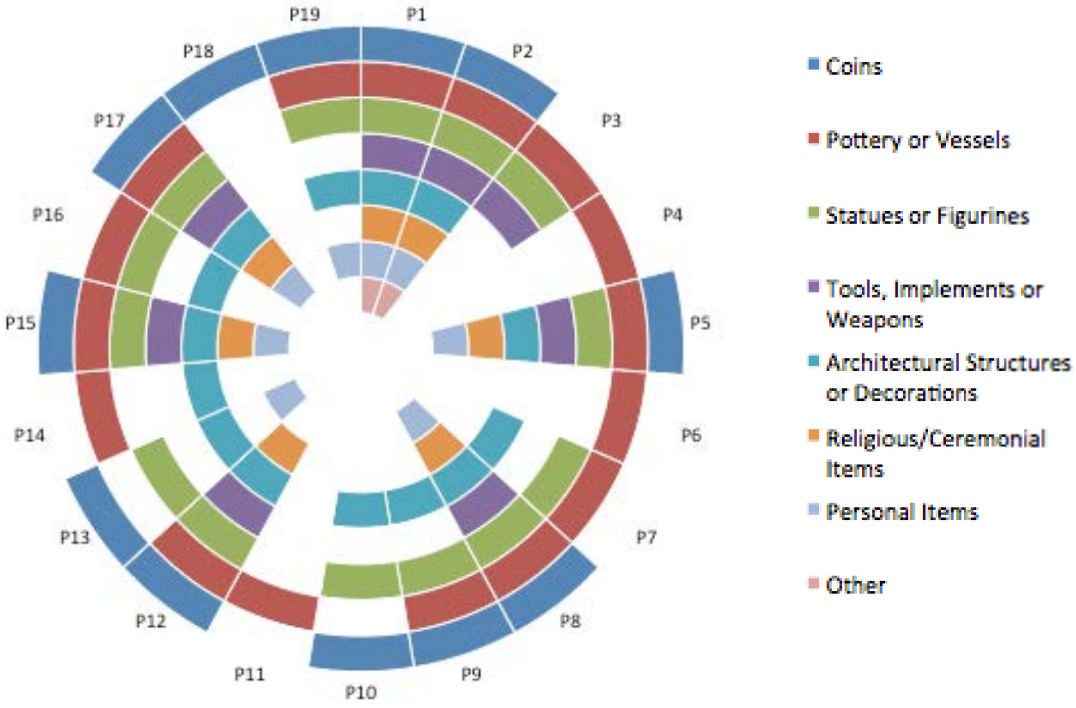

Figure 4.2: Breakdown of Artefact Types Studied by Participants

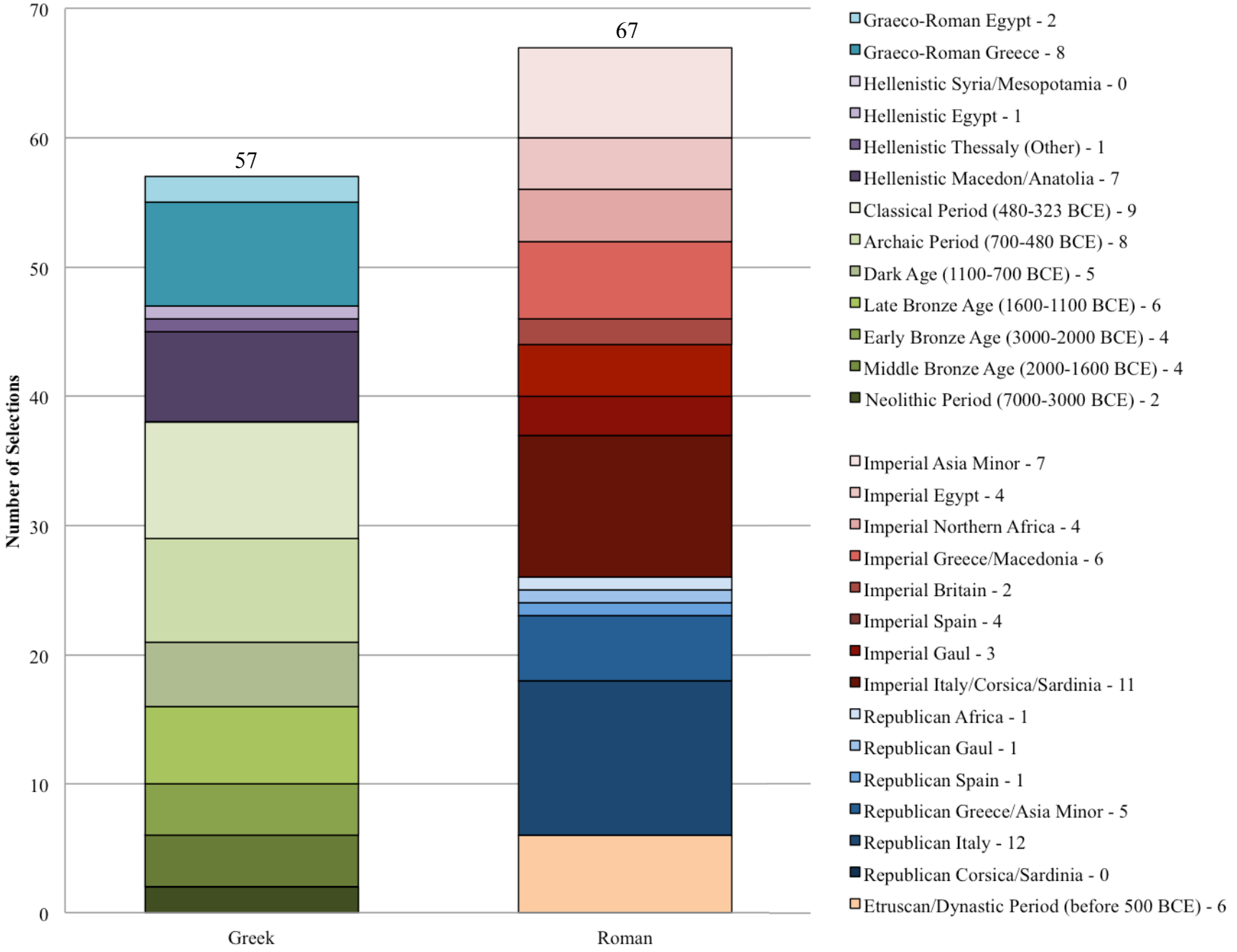

Figure 4.3: Breakdown of Time Periods and Locations Studied by Participants

Imperial era, the Republican era and pre-Hellenistic Greece.[147] The most often chosen answers were Republican and Imperial Italy, closely followed by Classical Greece. The only non-represented options provided were Hellenistic Syria/Mesopotamia and Republican Corsica/Sardinia. The single 'other' answer was Hellenistic Thessaly, a specific province of Macedon/Anatolia. The majority of respondents specialized either geographically, studying the same place over several time periods, or temporally, studying several places in the same era. A few participants, however, seemed to have more general research interests, and selected nearly all of the Roman choices, all of the Greek choices, or a wide range from both.

Despite a few gaps and a dearth of specifically Art Historian respondents, considered together the demographic questions show a wide variety in the interests of participants. In addition to demonstrating the diversity among scholars even within as finite a sample as that used in this study, these results also suggest that the rest of the survey can be considered in terms of researchers who generalize and those who specialize, allowing the analysis to reflect the information needs of scholarly users in museums with materials of a particular type or from a single era, as well as those with broad collections.

4.2 Information-Seeking Behaviour

Only one of the respondents indicated in question four they had never used digital resources to locate artefacts, and they provided no answer for the negative rendition of question five, thus only the responses for the positive alternative will be discussed. The

[147] An alternative data set was also calculated as if the six categories listed were the only options, removing the inconsistent spread of locations and the numerous time periods in the pre-Hellenistic era. The only notable change was in the Republican category, which became equal to the Imperial; all other proportions remained the same.

thirteen responses to the instruction 'list any digital resources that you use regularly to access artefacts for research, and what you find useful about them' revealed several notable themes. A total of twenty-six unique resources were listed in the responses, including both general types of sites, such as "various museum collection web sites", and specific online catalogues like the American Numismatic Society (ANS) website.[148] By examining the natures of the collections, as well as the creators or hosts of the resources, these twenty-six items can be divided into two categories and a series of subcategories, as shown in Table 4.1.

The first category includes those websites representing 'specialized' collections, meaning those housing only a specific type of object. These were predominantly databases of epigraphs and inscriptions, which though textual in content are generally found on buildings or funerary markers that would thus be included under either architectural structures or religious items as listed in question two. Other subcategories included three websites hosting only coin collections, and the *Corpus Vasorum Antiquorum* with a pottery and vessel collection.

The second and larger category contains those resources with general collections, both in terms of the types of items they house and in most cases the cultures or subjects they include. A number of subcategories within this group were clear, including catalogues for collections in public museums and for collections housed at universities, websites hosted by archaeological institutes or schools, and resources created by other third-party organizations whose records span museum boundaries. Two responses alluding to "Various Museum Collections Web Sites" were made, with the British

[148] Jstor was also listed by one respondent, but as this is purely a textual resource it has not been included.

Museum, Louvre and Metropolitan Museum of Art (MMA) given as examples, and the answer was thus categorized as a public institution though the participants could have been implying the inclusion of university museums as well.[149]

Table 4.1: Resources Used for Artefact Research as Listed by Participants

Specific	General
Epigraphs	*Public Museums*
Packard Humanities	Louvre website
Inscriptiones Graecae	British Museum website
Ubi Erat Lupa	Metropolitan Museum of Art
Claus-Slaby archive	"Various Museum Collections Web Sites"
Anne Jeffrey Archive	*University Museums*
Coins	Beazley Archive (Oxford)
American Numismatic Society Database	McMaster Museum of Art website
Coins of Magna Grecia website	Pitt Rivers Museum (Oxford)
Roman Provincial Coinage Online	Harvard Semitic Museum
Pottery	University of Cologne Sculpture Collection
Corpus Vasorum Antiquorum	*Archaeological Institutes*
	"Non-institutional private websites of archaeologists"
	American School of Classics Studies at Athens
	American Academy at Rome
	Arachne
	Cross-Institutional Collections
	ArtStor
	Art Resource
	Perseus
	International Association for the Conservation and the Promotion of Plaster Cast Collections

Eight of the resources were listed multiple times, as shown in Table 4.2, the most mentioned being the British Museum website. Considered categorically, major public museums appear to be the most widely used digital catalogues, and accounted for a full quarter (ten out of forty) of the total number of entries. This may be an indication that the websites of such institutions are indeed meeting the needs of scholars well, but it could

[149] Participants 7 & 19.

just as easily reflect the fact that most of the Classical artefacts unearthed are stored in national public institutions in Europe, including the British Museum and the Louvre. With this in mind it is notable that not a single Greek or Italian museum was listed, despite the number of cultural heritage institutions in these countries, and instead resources from American archaeological schools were preferred in these countries. It can be inferred that the quality of public museum websites is at best inconsistent, and developing a standard for metadata and interface design can only help the museum community as a whole.

Table 4.2: Resources Listed Multiple Times

Category	Resource	Times Listed
Specialized	ANS Database	3
	Claus-Slaby archive	2
General - Cross-Institutional	ArtStor	3
	Art Resource	2
General - Archaeological	Arachne	3
General - Public Museums	British Museum website	4
	Louvre website	2
	Metropolitan Museum of Art website	2
	Non-specific museum websites	2

The other half of question five concerned what it was about the resources discussed above that the participants found useful. Only seven of the respondents elaborated on this matter, but by analyzing the comments with a simple coding of themes, six factors emerged as important considerations:

- Collection size;
- Presence of images;
- Ease of use;
- Quality of information;
- Website design; and
- Inclusion of reference materials.

The universality of these factors among participants varied. The most mentioned concern was the size of the collection included online, described with phrases such as "lots of material" and "comprehensive", and mentioned ten times by four different participants.[150] In contrast the inclusion of reference materials, specifically primary documents and bibliographic sources, was a benefit quoted by only two of the respondents.[151] Concepts related to website design were mentioned by three of the responding participants, but in respect to very different aspects of performance and modernity. These included the available search fields, a "quick responses to queries…", and that the appearance was not "outdated".[152]

Participants also used these factors both to praise and to critique the resources they listed. In respect to the presence of images, for example, the Harvard Semetic Museum, the British Museum and the ANS website were commended, but the fact that "…not all the images are there" was considered a downfall of the Arachne website.[153] Participants similarly approved of the ease of use of the Claus-Slaby archive, the Art Resource, and the British Museum, with the search functions mentioned in particular, while this consideration was another criticism of Arachne, which was characterized as "very hard to use".[154] Where the German website excelled, however, was in the quality of the data included, which was described as "detailed and informative".[155] It should be noted that only Participant 13 mentioned this latter factor, but the respondent included it

[150] Participants 5, 8, 13 & 19.
[151] Participants 8 & 13.
[152] Participants 13, 18 & 19.
[153] Participants 6, 9, 13 and 18.
[154] Participants 13 & 19.
[155] Participant 13.

in relation to all of the resources they listed, and it appears at least for this scholar to be one of the most important considerations.

Two of these factors, namely images and reference material, were addressed in other survey questions and will be discussed below. The remaining considerations, however, are beyond the scope of this study and suggest possible avenues of future research. As mentioned in Chapter 3, ideas such as ease of use and modernity are difficult to assess in a survey, and would best be addressed through user testing of existing or prototype systems. Such tests are common in the field of Human-Computer Interactions, and a methodology specifically designed for non-experts to employ has been developed in relation to digital exhibition interfaces.[156]

The importance attributed to the size of the catalogue, meanwhile, is to a large degree an issue of museum policy in committing to include the full collection online rather than just a snapshot of current exhibits, as is a common occurrence. It also speaks to the desire for museum networks such as CHIN and the Europeana project as discussed in Chapter 1, though underdeveloped inter-institutional standards make these initiatives challenging to maintain.

Finally, the quality of information is a factor that must be taken into account on two levels: the types of data that are present, the requirements of which are considered in relation to other questions below; and the accuracy, objectivity and reliability of the data itself. Participant 6 discussed this issue directly in response to question twenty, criticizing that "…sometimes the information has been entered by someone who is clearly not a specialist". This again falls under the purview of museum policies, but is something that should be kept in mind for any museum digitization or website projects.

[156] Vilar, Filgueiras, and Rebelo, 359-367; Cunliffe, Kritou, and Tudhope.

As noted in the previous chapter, during the pilot-study phase question six asked participants to describe their process for locating and using Classical artefacts, either digitally or physically. The hope was to gain an understanding of the steps the respondents went through when researching, for example if they first searched for specific traits and then browsed for similar items. One of the responses was the inspiration for the revised question and is included in the analysis below, but the answers that the other pilot-study participants gave will be discussed first.

Both respondents provided a list of resources as part or all of their answer. Participant 3 noted three items: Google Images; the Greek Ministry of Culture website; and non-digital library sources such as the *Archaiologikon Deltion*, with no indication of how or why they are employed. Participant 2, meanwhile, included nine categories of resources they use, including "online databases like Ubi Erat Lupa and Arachne", which had not been part of their response to question five, as well as numerous types of textual sources, visiting a physical museum, and "information from colleagues". The respondent also provided the context: "Main modus operandi: record all pertinent information and obtain an image if possible". It is unclear if the orders of the lists were important in these answers, or if the participants were simply noting other resources they use in the style of question five.

Although neither response was particularly illuminating about the steps involved in the participants' research, there area a few points that can be extracted. First, secondary sources such as books and articles are used in addition to databases and collections, suggesting either that interpretations are also of value, or that the raw data in such publications is more accessible than that in online catalogues. Second, at least for

Participant 2, the information is pulled out of the resources and recorded elsewhere, presumably for later analysis. Exactly what this indicates is unclear, though it may suggest uncertainty about re-finding records, or that the varying interfaces from different websites make comparisons difficult, both issues that could be addressed with more information. These possibilities, as well as a general line of inquiry around the research process, would be important to pursue in future interview-based studies, but for this survey an open text field was not conducive to detailed answers.

The question used for the full-scale study enquired instead about the purposes of participants in looking for artefacts, and provided two possible examples: 'to find comparisons for a known object' and 'to find artefacts with a particular subject'. Many of the thirteen respondents included one or both of these examples as part or all of their answer, arguably making these purposes misleadingly common, but there was still valuable data to be extracted. For those seven participants who listed finding a comparison as a reason, there were two kinds of known items mentioned explicitly, each an equal number of times.[157] As Participant 8 listed them, the purposes were finding "1) comparanda for objects from excavation" and "2) comparanda for objects that are focus of publication". Nearly an equal number of respondents included 'finding artefacts with a particular subject' as a purpose, with no additional information given.[158]

There were another three reasons given beyond the examples provided, which provide a less biased view of respondents' objectives. A few participants mentioned finding details about a known object, Participant 19 specifically indicated details that they "might not be able to find through traditional text-based, hard copy books,

[157] Participants 1, 5, 6, 8, 11, 12 and 19.
[158] Participants 5, 7, 8, 13, 16 and 19.

catalogues and scholarly articles".[159] Additional respondents included "looking for high quality images" and "to examine trends and patterns" as other purposes for accessing digital resources.[160] As with all of the open-answer questions posed, pursuing the matter further in an interview format would yield more clarity, but the responses provided offer a decent overview of the intentions of scholarly users when accessing a digital museum resource.

In question nine, when asked to estimate what percentage of their time participants spent browsing versus searching, the responses showed a wide degree of diversity. Treated statistically, the average was 37 percent spent browsing and 65 percent searching, with a mode of 30 percent and 70 percent respectively.[161] Six of the respondents, however, answered that they spent as much or more time browsing as searching, the highest split being 70/30 percent. If the three participants who replied that they spend all of their time searching are excluded from the calculation, making it an average of only those who use both tactics, the revised result is 43 percent browsing and 56 percent searching. If the results were generalized into behavioral characteristics, the two main groups would be participants who spend a nearly equal amount of time searching and browsing; and participants who search far more than they browse. With a twenty-point difference being considered the threshold between 'nearly equal' and 'far more' (ie. a 61/39 percent split would be considered 'far more'), only one participant would not fit into these two groups. There is no evident trend between participant demographics and which behavioral group they belong to. In summary, a search function

[159] Participants 10 and 19.
[160] Participants 18 and 19.
[161] One of the participants entered a range of 0-30% browsing and 70-100% searching; for the statistical calculations the upper extreme of both was used resulting in combined averages that do not equal 100%.

might be more used by some scholars, but an effective browsing system should not be overlooked.

In terms of what such a browsing system might look like, question ten addressed the classification schemas that participants would be likely to access when perusing a museum website. A visual breakdown of the responses is shown in Figure 4.4. Of the six options provided, 'by time period' was the only universal choice among the sixteen respondents, while 'by object use' was the least checked, being selected by only seven participants, including five who chose all of the options.[162] The most prevalent combination of choices were the four traditionally employed by museums: 'by time period', 'by culture', 'by material', and 'by location', and this set was selected by 25 percent of respondents.[163] Participant 2 was the only one to enter an 'other' value, and suggested that they would find browsing by keyword helpful. It is unclear precisely how they meant this; it could imply a word cloud of social tags as is becoming popular on commercial sites, but based on the example they provided, "Mithras", a Roman goddess, they might also have used keyword as a misnomer for browsing by subject. Overall, this analysis suggests that there are some scholars who are content with the traditional methods of sorting artefacts for browsing, and others who would prefer to be offered as many categorizations as possible.

The next series of questions related to participants' search habits. Question eleven asked participants to rank how likely they were to use certain delimiters on a four point scale from 'never use' to 'use consistently'. In order to analyze the results these ranks were converted to a numerical scale from zero to three, with blank entries treated as gaps,

[162] Participants 3, 7, 10, 16, and 17 chose all; Participants 1 and 13 also chose 'by object use'.
[163] Participants 5, 6, 11, and 19.

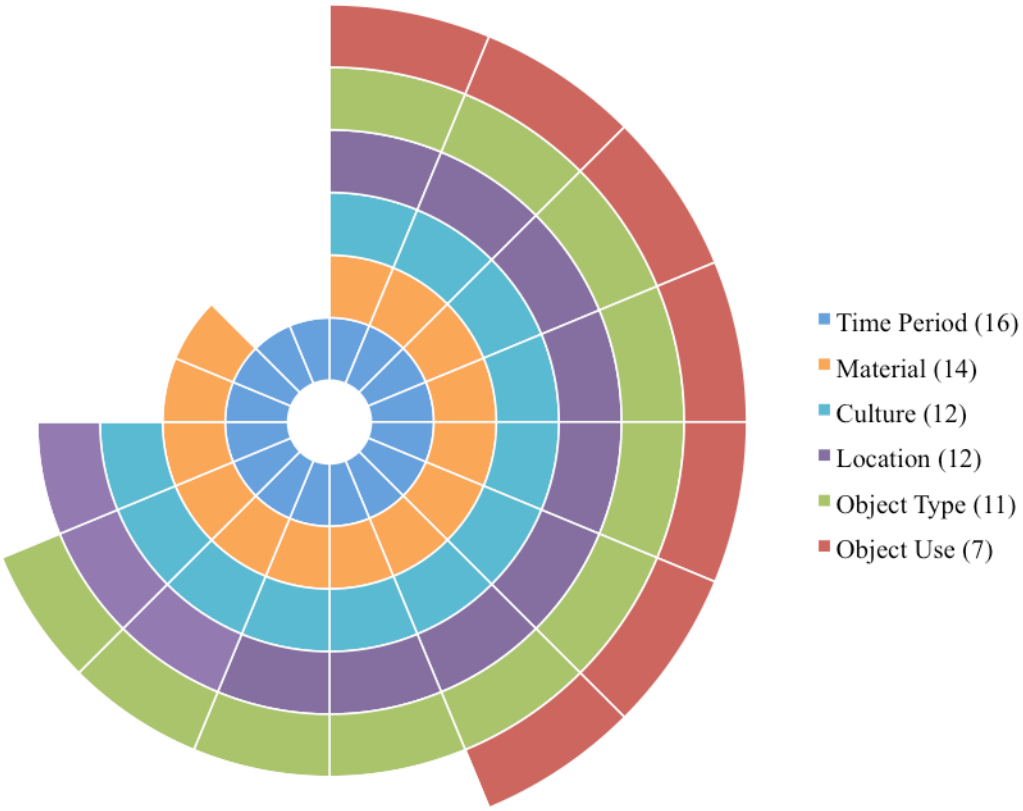

Figure 4.4: Comparison of Browsing Categories Chosen by Participants

not zeroes. Six options were ranked higher than 'use regularly' on average, including in descending order: object type (2.47), keyword (2.43), subject (2.33), creating culture (2.19), time period (2.19), and object name (2.13). The remaining four options scored between 'use infrequently' and 'use regularly', though there was a noticeable gap between the upper two, material (1.88) and location (1.81), and the lower two, feature (1.29) and artist (1.20). The 'other' option was not used by any of the participants. These results are in contrast to the answers provided about browsing in question ten, as time period, material, and location were the most picked categories, and object type was selected by less than half of respondents.

While the sample size is too small to draw definitive conclusions, there is also an interesting potential trend between the respondents' areas of study and their likelihood of

using certain search fields. Rather unintuitively, those participants who identified themselves as Art Historians were only half as likely (0.60) to use an artist field compared to either Historians (1.25) or Archaeologists (1.33). This may be a result of the comparatively few Classical artefacts that have a known artist, but further inquiry, hopefully involving pure Art Historians in the sample population, would be required to move beyond speculation. There were no evident trends between the types of artefacts studied and the search fields used.

Question twelve, a companion to the previous one, asked how many of the delimiters noted the participants might use in a single search. This is a factor that can influence system performance in terms of speed as well as precision and recall, and must be considered in the database and programming designs. Only a single participant indicated that their habits were too inconsistent to answer. Of the remaining fourteen respondents, the three to four delimiters range was the highest and by far the most popular response (67 percent), giving a likely threshold for system testing.

Completing the series of questions concerning search queries, number thirteen looked at the types of terminology the participants were prone to use in search fields. This has implications on both how artefacts should be described in surrogate records, and in what areas a thesaurus might be effectively used. The three broad categories of terminology included were designed to determine if the participants would use the general terms, such as the public might, field-specific technical terms, or would rather not name the item but instead describe its features. The underlying question was not well suited to a survey, where the instructions needed to be kept brief and the categories were presumptive, and thus the results are not particularly clarifying. On average, technical

terms ranked highest (5.4), closely followed by descriptive (4.9) and finally general (4.2), but the differences between the categories' ranks are fairly minor. A full 25 percent of respondents selected 'very likely' for all of the categories, while another 25 percent did not select 'very likely' for any of them, and no 'other' option was included for these to indicate an alternative preference. At this juncture the only conclusion that can be drawn is that scholars use an array of terminology types in their searches, but the validity of this must be tested further in the future using more appropriate means.

Overall, the questions investigating participants' information-seeking behaviours provide a rough overview of where scholars look for data on artefacts, what they intend to use the data for, and how they might locate it within a resource. These indications will help contextualize the answers provided in the rest of the survey, and offer a few areas that could be examined more closely in future qualitative studies.

4.3 Metadata

The metadata describing each artefact affects not only the search process, but also how useful the record is for users. While helping locate objects is important, the value of digital surrogates will remain limited if they cannot replace a visit to the physical museum. Question sixteen thus enquired about the types of metadata the participants need to do their research. The overall results, as well as comparisons including only the constituents from each field of study, are shown in Figure 4.5. The two categories desired by the lowest percentage of respondents, object condition and curatorial interpretation, both at 31 percent, are notable because they are the most important for museum staff and the general public respectively, supporting the idea that scholars have information needs that differ from both groups. On the other end of the scale, the top three chosen categories

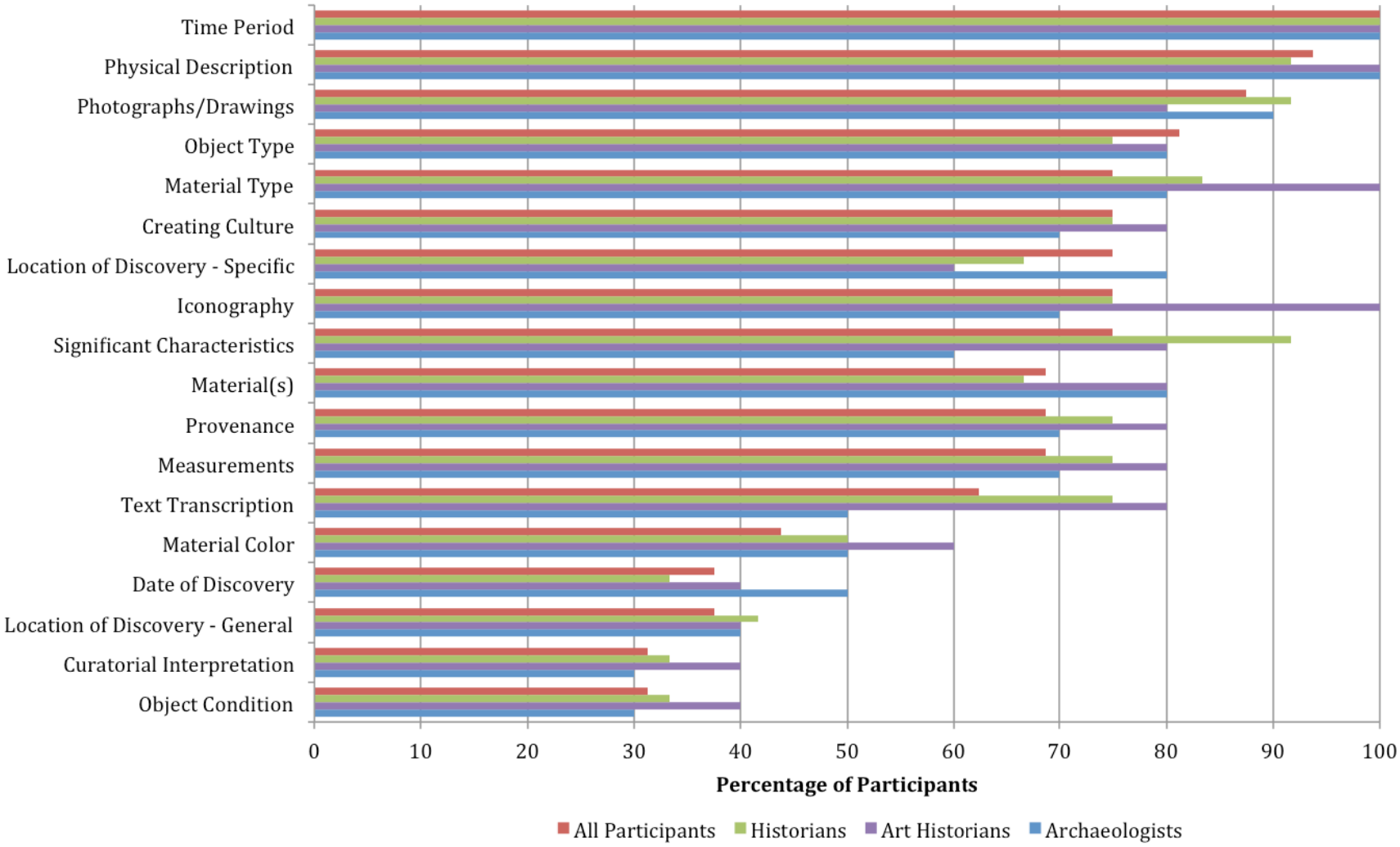

Figure 4.5: Comparison of Useful Artefact Information by Discipline

were time period, which was universally selected, a physical description (94 percent), and photographs or drawings (87.5 percent). In addition the only 'other' category added by a respondent was for "as precise a date as possible" (not shown in the chart).[164] Evidently the only information more valuable than an artefact's appearance is when it was made.

Comparing the overall results to those in particular fields of study revealed some interesting divergences. The Art Historians' preferences were generally higher than the total percentage, though they were interestingly lowest in the desire for photographs. The three areas where they were substantially higher than the other groups, iconography, material type, and material color, all speak to the decoration or quality of the object, as would logically follow from the research these scholars do. A similar predictability accompanies the need of Archaeologists for information on the date and specific location of discovery, as these would be key sources of comparison for their own sites. The only notable peak for the Historian demographic was significant characteristics, which may indicate these participants are more interested in unique or unusual items. As always, a larger sample size would be needed to establish these trends with any degree of certainty.

Closely connected to the results above, question twenty addressed what information participants found was frequently missing from online database systems. In the answers provided, two responses can again be pulled out as themes: 'quality of information', identified by six participants, and 'images', identified by three. Simply generalizing the answers as such, however, would dilute the valuable specifics that participants included, and thus each response within these areas will be discussed individually.

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[164] Participant 2.

In terms of information quality, Participant 2 replied that they could not identify specific metadata elements that are regularly missing because it "varies enormously, depending on the information source". This reinforces the idea that the lack of standards across institutions is problematic and should be addressed. Participant 6, as discussed above, commented on the information being entered by "someone who is clearly not a specialist". This sentiment was echoed more specifically by Participants 8 and 13, who noted respectively that dating was often vague and that technical terms were frequently not used when describing depictions of clothing. In addition, Participant 19 cited "complete artefact dimensions and weights", while Participant 1 added the "condition of the artefact" and scales in photographs as further missing metadata components.

On the topic of images, Participant 19 indicated that some databases do not provide any images of certain artefacts although they are necessary for "comparison and identification purposes". The answer given by Participant 7, that "information on aspects/sides of the object not visible in photograph" is absent, takes this further by indicating that a single image is not sufficient, and that the descriptions provided are not compensating for the absence of thorough photo-documentation. Finally, Participant 10 gave a very specific note on image presentation, suggesting that they would like to be able to "click or hover over an aspect of the image and have a blurb describe it". Clearly the participants have very different expectations of the images on websites, ranging from a simple presence to a fairly advanced programming feature, but this is another matter for which standards should be set and followed.

The remaining questions related to metadata were closed-answered and are summarized in Table 4.3 below. The discussion that follows briefly elaborates on the results.

Table 4.3: Summary of Closed-Answer Metadata Questions

Question	Responses			
Would you prefer that related artefacts, for example a set of tools, be described and presented individually or as a set?	*Individually* 8	*As a set* 5	*No preference* 3	
Which of the following options best represents your opinion towards images of artefacts in a digital resource?	*I don't care about them* 0	*I appreciate when they're present, but don't require them* 3	*It is difficult to perform my research without them* 8	*I hesitate to use artefacts digitally if images are not present* 5
Do you consider general images or images of details to be more useful to your research?	*General images* 0	*Images of details* 2	*Both are equally useful* 14	*Neither is useful* 0
Do you consider measurement scales to be important components of images?	*Yes* 13	*No* 2	*Only in detail images* 0	*Only for specific types of artefacts* 1*
Is the ability to download and/or reproduce (under a creative commons license) images of artefacts important to you?	*Not Important* 1	*Somewhat Important* 10	*Very Important* 5	

In much the same way that a library must decide whether a record is to represent each article or an entire journal, the granularity with which artefacts are to be described is a consideration, and this was addressed in question seventeen. It is a premise of this paper that websites should be user-focused rather than collection-focused, and as such some of

* See explanation in text.

the principles that govern granularity are self-evident. Namely, the relationship that merits a group description should be inherent to the objects, for example coins created at the same mint, and not simply that the same person donated them, as is often the case. With this established, there are benefits and drawbacks to each approach; artefacts treated individually will likely be described with greater detail, while objects treated as a set may reveal connections that would not be obvious to users otherwise. Overall, half of the sixteen respondents wanted items be described individually, 31 percent chose that related items be treated as a set, and 19 percent had no preference. The ideal balance is perhaps to create sets of items, but to describe each component in sufficient detail that it could stand alone. This would increase the time required to enter metadata, however, and if museum resources were limited these responses would suggest individual description is preferable.

The next three questions continue the theme of images, and the responses emphasize their significance yet further. In question twenty-one, when asked to indicate the importance of images to them, the sixteen responses were split between three for 'I appreciate when they're present, but don't require them', eight for 'it is difficult to perform my research without them', and five for 'I hesitate to use artefacts digitally if images are not present'. In essence over 80 percent of participants find records without images to be problematic, making photographs at least as valuable as written descriptions. In terms of the subject of the photograph, the responses to question twenty-two showed the predominant viewpoint is that both general and detail images are equally useful, though two of the sixteen respondents found detail images superior.[165] A similar majority favored the inclusion of scales in question twenty-three, though one participant,

[165] Participants 10 and 12.

selecting ‘Only for specific types of artefacts’ as the only option with an attached text box, noted that there should be scales for "all artifacts, but not in every publication".[166] Taking quality photographs can be one of the more expensive and time-consuming tasks of artefact description, but the responses to these questions indicates that for scholars the results are well worth the effort.

A matter related to the inclusion of images is whether they can be protected or need to be available for reproduction in articles and presentations. Bertacchini and Morando recently published an article examining the different methods for including images available to museums, but emphasized the benefits and drawbacks of each for the institution, rather than examining how they would affect user groups. As noted in that article, many institutions have been hesitant to provide high quality images on their websites because user downloads “…are likely to threaten museums’ economic control over their intellectual property and to erode their authority as leading players in the authenticity, integrity, and contextualization of artworks and cultural objects”.[167] Question twenty-four was intended to provide some data on the likelihood of scholars downloading images, either to have on hand for their research or to submit with publications. Of the sixteen respondents, one answered that they were ‘not likely’ to download images, ten that they were ‘somewhat likely’, and five that they were ‘very likely’. While this does not provide any clear solutions to what is ultimately an issue of museum policy, it does confirm that the matter needs to be addressed.

[166] Participant 2.
[167] Bertacchini and Morando, 60.

4.4 Interface Design

For information retrieval, one consideration specific to collections of Classical antiquities is the need to enter data in non-Roman, particularly Greek, alphabets. Transliteration of foreign texts in the metadata into their Roman equivalents can alleviate this need, but also results in a loss of data. Alternatively, if the original alphabet is used the challenge introduced is how a user should enter text into search fields. A common method for surmounting this issue is to employ a system of Roman-equivalent letters, used, for example, in Microsoft and Adobe products with the font 'Symbols'. Some of these exchanges are intuitive, such as 'a' for 'alpha', but others including 'q' for 'theta' and 'w' for 'omega' require an understanding of how the code works, and makes checking for typographical errors more difficult.

The results of question seven suggest first that the challenges of entering Greek text is a real concern, as only one of the sixteen respondents indicated they never did so, and second that the participants are not attached to the method of inputting text described above. The scorecard of the answers selected included one for Roman-equivalents with no translation guide required, four for an onscreen Greek keyboard, and ten for preferring both methods were offered. While these are only two possible solutions to the problem, the trend indicates that alternative text entry options would be appreciated. The answers to question eight show that this extends to other languages as well, including Palmyrene, Hebrew, Nabataean, and Arabic, which were listed by three respondents as ones they have used.[168] While the need for such a feature in a system is naturally conditional on whether a museum has any artefacts with inscriptions using these alphabets, it is a matter that should be considered when planning a website.

[168] Participants 2, 5, and 15.

Another role of interface design is to make the retrieved information easier for users to process and understand, thus the expectations of scholarly users in this regard are just as important as the aspects discussed above. For most of the questions on this topic, the participants were overwhelmingly in agreement. Question fourteen showed that a combination of images and text are needed to assess search results, while numbers eighteen and nineteen indicated that contextual material as well as visualizations presenting information would be appreciated.[169] In question fifteen the results show that the participants are certainly not willing to give up a single record view, as fourteen out of the fifteen respondents ranked this as their first choice, but nearly half would also find comparison and table views helpful.[170] The counts of the ranks from first to third were 7-4-4 for a comparison and 6-4-5 for a table. There were four participants who indicated all views were equally useful, for which the ranks were all treated as first.[171] Somewhat predictably, there appears to be a correlation between respondents who stated in question six that their purpose was to find comparisons for objects, and those who ranked the multiple record views higher, though this was not uniformly the case. In general, the theme across the interface questions was that more options are better, though user testing on practical systems would be a necessary step to ensure users were not overwhelmed.

4.5 Additional Participant Comments

The final question, an open call for comments, garnered responses from two participants that reconfirmed concepts implied elsewhere in the survey. Participant 7 noted that it "would be nice if there was a common standard for on line [sic] publication",

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[169] Question 14: 14 participants answered 'both', Participants 1 and 7 answered 'images'; question 18: 14 participants answered 'yes', Participant 12 answered 'no', Participant 5 answered 'uncertain'; question 19: 14 participants answered 'yes', Participants 15 and 18 answered 'uncertain'.

[170] Participant 12 ranked 'individual' as third.

[171] Participants 2, 6, 7, and 11.

a recurrent theme in relation to metadata and information quality. Participant 19, meanwhile, brought up several points that bear discussing. The first is an acknowledgement that many digital resources "…still need much work done…" to make them more complete representations of the collections, and that "more resources need to placed towards such initiatives…". This echoes the findings of Hertzum from fifteen years ago that the production of many museum websites was a side project not prioritized by management, perhaps indicating that in museums as a whole little has changed since the late 1990s.[172] The second point of interest is that the respondent found their use of digital resources was increasing over time, which bodes well for the importance of museum websites, but that they also often returns to print resources "…for identification and referencing", perhaps as a result of the incomplete online records.

The questions posed in this study were far from exhaustive in examining the needs of scholars, but recurring trends in the answers suggest what the important issues are, and some potential solutions to them. The results were applied to the creation of the criteria rubric available in Appendix B and used to evaluate the websites of ten diverse museums throughout North America as discussed in Chapter 5. In the concluding chapter of this thesis, the results of both these studies are summarized as recommendations of priority and ancillary areas that should be addressed in order to improve the functionality of museum websites for academic researchers.

[172] Hertzum, 131.

Chapter 5 – Website Assessment Analysis and Results

The results of the user study described in Chapter 4 provide an outline of what scholars need and expect from museum websites. The website assessments presented in this chapter, conducted in June of 2014, examine another aspect of this topic by evaluating whether the online resources of these institutions are actually providing the information and functionality required by academic researchers. The completed rubrics for the ten museums included in the study (see Table 3.1) will first be discussed independently to highlight the strengths, weakness, and notable features of each in regard to their information retrieval systems, interface designs, and included metadata. Following this, trends in these areas that span several or all of the institutions will be analyzed to determine what is already established as best practices and what remains unaddressed. These results will then be incorporated into the recommendations offered in the concluding chapter of this thesis.

5.1 Individual Website Assessments

5.1.1 American Numismatic Society[173]

The American Numismatic Society (ANS) website is arguably the most well-suited to scholars of the museums examined in this study in terms of its information retrieval system and record details. In addition to scoring nearly perfectly on the listed searching and browsing fields (see Table 5.1), the other limiters available suggest a genuine appreciation for the range of research interests a scholar might have. The field the website terms 'manufacture', for example, allows users to search or browse based on how a coin was made (struck, cast, etc.), a factor that is integral to answering certain

[173] American Numismatic Society, *MANTIS*, http://numismatics.org/search/ (accessed June 10, 2014).

research questions. The search form is also unique among the websites studied in that it offers both free text and prepopulated options for almost all of the fields, meaning that new users do not need to blindly predict the terminology used, but experienced users do not need to work through extensive lists of choices.

The interface features included also suggest an awareness of users' needs. This was the only website assessed that had any manner of comparison functionality, though it was on a list-to-list basis, rather than a record-to-record one. The ability to map and graph search results in addition to this side-by-side comparison provides a great capacity for evaluating groups of items and determining trends. For locating and viewing single objects, the ANS site provides fewer options and generally less sophistication than some of the other websites, but it is nonetheless easy to work through pages of results and to locate metadata of interest within records.

The main weakness of this website is the poor consistency of the records. Those objects that have images overwhelmingly have two, but only 22 percent of the collection has been photographed. The textual metadata, meanwhile, varies between extremely thorough and a bare minimum, and it is entirely unpredictable where on this spectrum any given record will fall. This irregularity is undoubtedly detrimental to recall rates, and even if the thin records were returned it is questionable whether they would support research queries. A likely justification for this inconsistency is the massive size of the ANS's Classical collection, which is ten times that of the next largest website examined, meaning that thoroughly describing all objects is a time consuming and, presumably, in-progress task. If all the museum's records are brought up to the standard of the most complete ones, the website, already one of the most listed as a useful resource by

participants in the user study (see Table 4.2) could become a model for best practices, at least for coins and medals.

Table 5.1: Assessment Rubric for the American Numismatic Society Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	Y
	Keyword	Y
	Subject	Y
	Creating Culture	Y
	Time Period	Y
	Object Name	Y
	Material	Y
	Location	Y
	Feature	Y
	Artist	Y
	Other	Dimensions "Manufacture"
Browsing		
Type		Faceted
Categories	Time Period	Y
	Material	Y
	Culture	Y
	Location	Y
	Object Type	Y
	Object Use	N
	Keyword/Subject	Y
	Other	Artist Provenance "Manufacture" Reference Has Images
Other		
Re-finding		Search by ID
Language Entry		User Settings
Query Parsing	Booleans	Y
	Truncation	Y
	Stop Words	N
	Thesaurus	N

Criteria	Value
Interface	
Search Results	
Multiple	• Lists of 20 results • Textual and visual identifiers • Inconsistent level of metadata; preview of larger images • Sortable by most fields • Full on-page refinement
Single	• Categorized textual metadata • Large, captioned images • Links to new searches on single fields
Other	
Comparison	• Side by side comparison of the results of two searches; search by Record Id equates to comparison of two objects • Minimal textual metadata in list • Single large image • Cannot link into full item record (possibly an intended feature but not working)
Visualizations	• Dynamic graphs of result lists
Contextual Material	• Maps of mints/findspots for single record or result lists

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Good
Fields	Time Period	Y
	Physical Description	Y
	Object Type	Y
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	Y
	Significant Characteristics	N
	Material(s)	Y
	Provenance	Y
	Measurements	Y
	Text Transcription	Y
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	N
	Object Condition	N

	Other	Axis "Manufacture"
Visual Metadata		
Number or Records	0 Photographs	3916 (78.3%)
(n = 5000)	1 Photograph	5 (0.1%)
	2 Photographs	1079 (21.6%)
	3+ Photographs	0 (---)
Complete Documentation		1079 (21.6%)
Records with Scales		0 (---)
Other		
Standard Used		N
Data Quality		Good
Data Consistency		Poor
References		Y

Criteria	Value
Other	
Image Use Policies	Copyrighted
Ease of Use	Good
Other Notable Features	• High capacity for studying groups of objects • Very large collection (~175,000 Classical items)

5.1.2 Brooklyn Museum[174]

The website design of the Brooklyn Museum has embraced many of the modern trends of Web 2.0 to engage users in not just exploring collections, but also in interpreting them. The site uses social tagging to allow visitors to contribute descriptors to artefacts that become part of the record metadata. These tags form a significant portion of the search system, covering both the subject and feature fields as listed in Table 5.2, and is the core component of the website's otherwise single-dimension browsing system by forming word clouds of the most-used terms. The system has been well taken by users, and there are currently over eight hundred registered members of what is termed the 'posse', a status that allows both the ability to add and edit tags and to save objects as

[174] Brooklyn Museum, *Collections: Browse Collections*, http://www.brooklynmuseum.org/opencollection/collections/ (accessed June 14, 2014).

favorites in a personal collection, but such tagging also negatively affects the website's data consistency and quality. Since the application of tags is at the whim of users, there is an extreme imbalance in how well items have been described; some records contain as many as forty tags, while others have none. As the tags are so integral to the searching and browsing systems, this imbalance severely influences recall success, and may in fact result in a compound problem wherein artefacts with no tags are less likely to be tagged because users cannot locate them. In addition, as Cameron noted when studying the viability of having public input in museum records, "…not all interpretations are seen as equal by users…", meaning that having metadata supplied by a person with an unknown level of expertise reduces the authority of the records.[175]

There are two results interfaces on the website, one accessed through browsing that consists of large volumes of objects in un-sortable grids of eighteen images, and one, as described in Table 5.2, that presents search results in somewhat more usable grids of thirty items identified by both images and the basic textual metadata of artist, title and date. The ability to sort these lists is still problematic, as the only choices are by the completeness of the records and by relevance, rather than by specific metadata. In addition, the algorithms for ranking relevance are of questionable accuracy, as a simple term such as 'Greek' will place items that are labeled 'Possibly Greek' before ones that are definitively applicable. The record completeness option draws on the unique feature that all records contain an indicator bar grading the thoroughness of the metadata. It is unclear whether this functionality is intended for museum staff, allowing them to track artefacts that need further research, or for general users, but the public acknowledgment of how complete the metadata currently is indicates a commitment to improving it.

[175] Cameron, "Digital Futures II", 250.

The evident standards of the website for a complete record, however, are significantly less than the expectations of scholars, at least for textual metadata. Several of the desired fields, as marked in Table 5.2 by an asterisk, are not supplied by staff, but are present only if a user happens to enter them as tags. In addition, a physical description, the second most important piece of metadata identified by scholars (see Chapter 4), is very rarely present and always combined with a curatorial interpretation. In contrast, though, the website offers reasonably thorough photographic documentation of the artefacts. Over 80 percent of the records have at least one image, a third have three or more, and almost 40 percent are completely represented. In addition, the website is unique in providing x-ray films of a few objects that have been scanned, allowing both their surface and interior to be viewed. The main criticism that can be made of the photographs themselves is that almost none contain scales, and the website instead offers a side-by-side comparison to everyday objects that is both difficult to judge accurately and assumes that the first dimension listed is the height, which is often not the case. Overall, although the reliance on automation and crowdsourcing is a detriment to the quality of the records, the excellent photography of the collection makes it one of the better-documented examples.

Table 5.2: Assessment Rubric for the Brooklyn Museum Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	N
	Subject	Y
	Creating Culture	N
	Time Period	Y
	Object Name	Y

	Material	Y
	Location	N
	Feature	Y
	Artist	Y
	Other	Description On View Has Images Copyright Status
Browsing		
Type(s)		Hierarchical
Categories	Time Period	N
	Material	N
	Culture	N
	Location	N
	Object Type	N
	Object Use	N
	Keyword/Subject	Y
	Other	Department On View
Other		
Re-finding		Personal Collection
Language Entry		None
Query Parsing	Booleans	N
	Truncation	N
	Stop Words	N
	Thesaurus	N

Criteria	Value
Interface	
Search Results	
Multiple	• Grids of 30 results • Textual and visual identifiers • Minimal metadata • Sortable by relevance and completeness of record • No on-page refinement
Single	• Lists of textual metadata • Large image with thumbnail gallery • Links to new searches on single fields • Links to related items
Other	
Comparison	• None
Visualizations	• Word cloud of major tags across collection

Contextual Material	• Visual scale by comparison to common objects (bottle cap, coffee cup, person)

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	Y
	Object Type	N
	Material Type	Y
	Creating Culture/Person	Y*
	Location	Y
	Iconography	Y*
	Significant Characteristics	Y*
	Material(s)	N
	Provenance	N
	Measurements	Y
	Text Transcription	N
	Material Color	Y*
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	N
	Other	Museum Location Rights Statement
Visual Metadata		
Number or Records	0 Photographs	90 (17.6%)
(n = 510)	1 Photograph	147 (28.8%)
	2 Photographs	96 (18.8%)
	3+ Photographs	177 (34.7%)
Complete Documentation		192 (37.6%)
Records with Scales		16 (3.1%)
Other		
Standard Used		N
Data Quality		Adequate
Data Consistency		Poor
References		N

Criteria	Value
Other	
Image Use Policies	Open Access
Ease of Use	Good
Other Notable Features	• Social tagging • Scale of record completeness • Videos describing artefacts

5.1.3 Cleveland Museum of Art[176]

Following the division of searching and browsing described in Chapter 3, the information retrieval system of the Cleveland Museum of Art website contains only a keyword search box, while there are a few faceted browsing options, most notably object type and creator (see Table 5.3), which can also be used to refine search results. The creator field, at least for Classical materials, would perhaps be better labeled as creating culture/time period, since it contains categories such as 'Greece, 7th century BC', but as there is no way to simultaneously select all options from Greece or from a time period of interest it does not function as equivalent to either of these fields. Despite the limited granularity of browsing and searching options provided, however, in terms of parsing a search the website has perhaps the most sophisticated systems of the museums assessed, including Boolean AND and OR processing, truncation, wildcards, a basic thesaurus, and, uniquely, stop words. Given a basic familiarity with the collection and the metadata included in records, these features can actually provide a higher precision and recall than do some of the more elaborate systems examined in this study.

The high rate of recall of the website is somewhat tempered by the difficulty of processing search results, given the interface design employed. The massive 128-item

[176] The Cleveland Museum of Art, *Collections Online*, http://www.clevelandart.org/art/collections (accessed June 15, 2014).

grid prevents continual cycling through pages, but can also lead to visual information overload, particularly since the returned items cannot be sorted. The primarily visual identifiers provided, with textual metadata only appearing during a mouse-over preview, also prevent any manner of direct item comparison. In the single record view, meanwhile, much of the information is presented as concatenated fragments of discrete metadata. The culture and time period, as discussed above, are strung together as an artist equivalent, while the material, dimensions and provenance credit form another continuous block. Select fields are repeated in a labeled list under a 'see also' tab, but in general a user must work to untangle the basic descriptions of an artefact.

What the record information entails, finally, is minimal textual metadata, much like the Brooklyn Museum, but a commitment to thorough photographic representation. The majority of objects have three or more images included, and 72.6 percent of them have every angle and detail captured, particularly the more intricate items such as statuary and vessels. For many items, the photographs compensate for the non-existent physical description, significant characteristics and text transcription, but two issues remain. First, the often poorly documented measurements cannot be interpreted from images because scales are not included. Second, the minimal written description of artefacts for which multiple photographs were not deemed necessary, most commonly jewelry and personal items, makes the records seem unreliable. Indeed for the roughly 2 percent of cases where no images exist, the records are effectively unusable. This issue goes beyond poor data consistency, and suggests a lack of awareness regarding the importance of detailed descriptions for scholarly users. Enhancing this aspect of the metadata would greatly increase the usefulness of the website for an academic audience.

Table 5.3: Assessment Rubric for the Cleveland Museum of Art Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	Y
	Subject	N
	Creating Culture	N
	Time Period	N
	Object Name	N
	Material	N
	Location	N
	Feature	N
	Artist	N
	Other	None
Browsing		
Type(s)		Faceted
Categories	Time Period	N
	Material	N
	Culture	N
	Location	N
	Object Type	Y
	Object Use	N
	Keyword/Subject	N
	Other	Department Creator Location in Museum On View Has Images Highlighted
Other		
Re-finding		Search by ID
Language Entry		None
Query Parsing	Booleans	Y
	Truncation	Y
	Stop Words	Y
	Thesaurus	Y

Criteria	Value
Interface	
Search Results	
Multiple	• Grids of 128 results • Visual identifiers only • Minimal metadata in preview • No sorting • Full on-page refinement
Single	• Mix of categorized and long strings of textual metadata • Large image with thumbnail gallery • Links to new searches on single fields
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• None

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	N
	Object Type	Y
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	N
	Significant Characteristics	N
	Material(s)	N
	Provenance	Y
	Measurements	Y
	Text Transcription	N
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	N
	Other	None
Visual Metadata		
Number or Records	0 Photographs	11 (2.2%)
(n = 497)	1 Photograph	79 (15.9%)
	2 Photographs	153 (30.8%)

3+ Photographs	254 (51.1%)
Complete Documentation	361 (72.6%)
Records with Scales	1 (0.2%)
Other	
Standard Used	N
Data Quality	Adequate
Data Consistency	Poor
References	N

Criteria	Value
Other	
Image Use Policies	Copyrighted
Ease of Use	Adequate
Other Notable Features	• None

5.1.4 J. Paul Getty Museum[177]

Much like the Cleveland Museum of Art, The J. Paul Getty Museum (Getty) website has a very simplistic information retrieval system. The only search field is by keyword, and there are a select few options for browsing (see Table 5.4). Unlike the previous website, however, the Getty's browsing system is hierarchical, not faceted, and there is no result refinement available. These differences mean that the lists of artefacts retrieved are consistently either too broad, too narrow, or both simultaneously. On the searching side, for instance, an inability to refine by time period or to sort results causes relevant artefacts to be intermixed with irrelevant ones. The rigidly structured browsing categories, meanwhile, allow users to view objects depicting major gods or minor gods, for example, but not both at the same time, nor can the depictions of major gods be limited to only those on vases, but must span the entire collection. In sum, the system provides high recall but poor precision, leaving the onus on users to work through long lists of results or to devise complicated search queries that minimize irrelevant objects.

[177] The J. Paul Getty Museum, *Collection*, http://www.getty.edu/art/ (accessed June 15, 2014).

This being said, however, the Getty is also one of only two websites examined that offers thorough subject-based browsing that is not dependent on social tagging. While this does not compensate for the of lack more basic options such as time period or culture, attributing subjects is a far more labour-intensive process than is enabling querying on existing metadata, and in this way the Getty website is in a good position to substantially improve their information retrieval system in the future with minimal expenditure of resources.

The interface design of the search results, though poorly set up for comparisons, has orderly and consistent textual metadata that is conducive to quickly identifying items that are and are not of interest based on date or location. The thumbnail size images, though, are only large enough to determine the general object types, and not, for example, to establish what imagery is on vessels or any other degree of detail. In the single-record view, much of the metadata is collapsed into a few unlabeled lines, while the majority of the space is reserved for paragraphs containing a combined physical description and curatorial interpretation. In addition, the images remain fairly small, and it is necessary to link to another page to see an enlarged or zoomable version. Overall, the layout seems to presume that basic metadata is less important to users than a narrative explanation, and perhaps thus that they have accessed the website to learn rather than to research.

A fairly reasonable proportion of the desired metadata fields are, however, checked off, and the records are by no means the thinnest of the websites studied. The larger issues are instead data separation, consistency and quality. As noted above, the physical description and curatorial interpretation are merged, as are the culture, location, and dates. The latter concatenated line is not particularly onerous to parse, but

nonetheless complicates a cursory assessment of an artefact, and is likely the reason why searching and browsing by these fields specifically is not an option. In addition, the length and specificity of the physical descriptions varies greatly between objects and the inclusion of conditions is very rare. Measurements are also not universally present, but when they are, the up to three dimensions included are almost never labeled and do not fully represent the facets of an artefact. Only 20 percent of the records contain more than one photo, and there are no evident criteria that mandate additional photographic documentation should be included. Although even the least-descriptive records remain useable, switching from a thoroughly documented object to an average one makes the latter seem questionably thin.

Table 5.4: Assessment Rubric for the J. Paul Getty Museum Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	Y
	Subject	N
	Creating Culture	N
	Time Period	N
	Object Name	N
	Material	N
	Location	N
	Feature	N
	Artist	N
	Other	None
Browsing		
Type(s)		Hierarchical
Categories	Time Period	N
	Material	N
	Culture	N
	Location	N
	Object Type	Y
	Object Use	N

	Keyword/Subject	Y
	Other	Artist
Other		
Re-finding		Search by ID
Language Entry		Transliteration
Query Parsing	Booleans	Y
	Truncation	N
	Stop Words	N
	Thesaurus	Y

Criteria		Value
Interface		
Search Results		
Multiple	• Grids of 10/20/50 records • Textual and visual identifiers • Minimal metadata • No sorting • No on-page refinement	
Single	• Listed textual metadata • Medium zoomable image with thumbnail sidebar • No links	
Other		
Comparison	• None	
Visualizations	• None	
Contextual Material	• Biographical information on artists	

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Poor
Fields	Time Period	Y
	Physical Description	Y
	Object Type	N
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	N
	Significant Characteristics	N
	Material(s)	N
	Provenance	N
	Measurements	Y

	Text Transcription	Y
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	Y
	Other	None
Visual Metadata		
Number or Records	0 Photographs	0 (---)
(n = 513)	1 Photograph	410 (79.9%)
	2 Photographs	50 (9.7%)
	3+ Photographs	53 (10.3%)
Complete Documentation		146 (28.5%)
Records with Scales		0 (---)
Other		
Standard Used		N
Data Quality		Adequate
Data Consistency		Poor
References		N

Criteria	Value
Other	
Image Use Policies	Open Access
Ease of Use	Good
Other Notable Features	• None

5.1.5 Kimbell Art Museum[178]

Following the trend of the last two websites, the Kimbell Art Museum also hosts an extremely basic information retrieval system. It is the most simple, in fact, of all the websites examined. The solitary search box, although labeled as including artists, works and keywords, matches on each of these fields indiscriminately and uncontrollably, making it functionally a keyword search alone. There is also no parsing system evident, but rather a straightforward string match is used, further limiting its sophistication. In addition, the single-tiered browsing system offers only one real category, creating culture,

[178] Kimbell Art Museum, *Collection*, https://www.kimbellart.org/collection (accessed June 16, 2014).

though it has highly specific options within this class, distinguishing, for example, Cycladic from Greek. This minimalist approach, however, is entirely in line with the scale of the collection, which contains fewer than twenty Classical artefacts, and a more complex system would likely hinder recall without helping precision.

The interface for the search results offers both a grid view, which hosts larger images suitable for visual identification, and a list view that presents the most comprehensive set of textual metadata of any website assessed. Indeed, unless a user wishes to read more of the curatorial interpretation, there is no need to move to the single record view to fully evaluate the artefacts; almost all of the information the records contain is available on the list page (see Table 5.5). As a result of this comprehensive inclusion of metadata, even at sixteen records a page the lists are very long, and offering the fifty or one hundred results a page that some other websites do would be entirely impractical, but again the small scale of the collection that the Kimbell Museum houses makes this an appropriate compromise. The single view expands on the paragraph of curatorial interpretation, offers a larger image, and a few expandable tabs of extra information, but generally presents the same information in the same format as the list view.

While providing such a high proportion of the total metadata in the lists of search results is beneficial, it is less impressive when the thinness of the records is considered. Most notably missing is a physical description of the artefacts, which when combined with spotty measurements and insufficient photographic representation results in an incomplete understanding of the objects. Only two of the Classical antiquities in the collection have more than one photo, and even those that do are not completely

documented. A decorated vessel, for example, includes a mention in its title that the interior depicts a Maenad, but none of the three images show it.[179] The emphasis is decidedly on curatorial interpretation, which not only makes up the bulk of the written metadata, but is also further expanded in audio recordings included with some records. Overall, the website might be used to identify items comparable to a known artefact, but performing intensive research into an object the Kimbell Art Museum houses would be difficult to complete online.

Table 5.5: Assessment Rubric for the Kimbell Art Museum Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	Y
	Subject	N
	Creating Culture	N
	Time Period	N
	Object Name	N
	Material	N
	Location	N
	Feature	N
	Artist	N
	Other	None
Browsing		
Type(s)		Single
Categories	Time Period	N
	Material	N
	Culture	Y
	Location	N
	Object Type	N
	Object Use	N
	Keyword/Subject	N
	Other	On View
Other		
Re-finding		Search by ID

[179] Kimbell Art Museum, AP 2000.02.

Language Entry		None
Query Parsing	Booleans	N
	Truncation	N
	Stop Words	N
	Thesaurus	N

Criteria	Value
Interface	
Search Results	
Multiple	• Grids of 16 records; lists of 16 records • Visual identifiers only; textual and visual identifiers • Comprehensive metadata • No sorting • No on-page refinement
Single	• Lists of textual metadata • Expandable image gallery • No links
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• Basic biographical information on artists

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	N
	Object Type	N
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	N
	Significant Characteristics	N
	Material(s)	N
	Provenance	Y
	Measurements	Y
	Text Transcription	N
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y

	Object Condition	N
	Other	None
Visual Metadata		
Number or Records	0 Photographs	0 (---)
(n = 27)	1 Photograph	23 (85.2%)
	2 Photographs	2 (7.4%)
	3+ Photographs	2 (7.4%)
Complete Documentation		1 (3.7%)
Records with Scales		0 (---)
Other		
Standard Used		N
Data Quality		Adequate
Data Consistency		Good
References		N

Criteria	Value
Other	
Image Use Policies	None
Ease of Use	Good
Other Notable Features	• Audio recordings describing objects

5.1.6 McMaster Museum of Art[180]

In contrast to the last few websites discussed, the McMaster Museum of Art website has no real browsing system, the only division being by department, but hosts a fairly comprehensive search form. It allows users to combine up to six criteria examining eighteen aspects of an object. Most aspects also provide multiple angles on which to search, for example the 'description' field can be examined for terms it 'is', 'contains', or 'begins with', while the 'begin date' field is optionally defined as 'greater than' or 'less than' the entered number. This arrangement gives the search system substantial flexibility to define precise parameters, though the benefits of this for Classical antiquities specifically are somewhat wasted as the collection consists of fewer than twenty items.

[180] McMaster Museum of Art, *Search the Collection*, http://emuseum.mcmaster.ca/emuseum/ (accessed June 17, 2014).

There are, however, a few aspects of the search system's functionality that make it less useful than it might be. First, only two of the aspects, classification (equivalent to object type) and department, offer Boolean OR and NOT options; expanding this to all options would greatly increase the possible precision and recall. Second, only those same two aspects produce prepopulated lists of options, while the others accept only free text entries. While for metadata such as description and title this is a desirable state, for others such as culture and period, entering search terms requires pre-existing knowledge of the collection and the terminology used to describe it. Considering there are a finite number of possible options for these fields, it would be an asset to have a list of existing terms from which to choose.

This website is the only one examined to employ a table-style list in the interface of search results. The arrangement is very conducive to interpreting and comparing returned artefacts, though it would be far more effective if the amount of metadata included were increased. The single item view retains a connection with the list of results, meaning that users can work through them by clicking 'Next' rather than continually returning to the previous page. The metadata in the records is also well organized and clearly labeled, which is a comparative rarity among the sites included in the study.

This content of the metadata, conversely, is the thinnest of the museums assessed in this study, with only five fields present. There are also only three antiquities, or roughly 10 percent of the collection, with more than one photograph, despite that several items with detailed decorations would benefit greatly from additional images. A disclaimer at the bottom of each record does note that the information "…does not necessarily reflect the complete or current details about the object" and that "research and

updating of [the] object records is ongoing", suggesting intent to address this issue, but it is unclear if or when this might happen. One field in particular, however, shows the potential for the quality information the website might someday hold. In most cases, measurements are exceptionally thorough, including details about the diameters of handles and bases, for example, instead of two or three total dimensions representing overall size. If it is presumed that this level of detail is the goal for the records, then in the future this website might be among the best.

Table 5.6: Assessment Rubric for the McMaster Museum of Art Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	Y
	Keyword	Y
	Subject	N
	Creating Culture	Y
	Time Period	Y
	Object Name	Y
	Material	N
	Location	Y
	Feature	N
	Artist	N
	Other	None
Browsing		
Type(s)		Single
Categories	Time Period	N
	Material	N
	Culture	N
	Location	N
	Object Type	N
	Object Use	N
	Keyword/Subject	N
	Other	Department
Other		
Re-finding		Search by ID
Language Entry		None

Query Parsing	Booleans	Y
	Truncation	N
	Stop Words	N
	Thesaurus	Y

Criteria	Value
Interface	
Search Results	
Multiple	• Grid of 12 records; Table of 10 records • Visual identifier and title; textual and visual identifiers • Minimal metadata • Sortable by title, date, and 'related people' • Full on-page refinement if searched
Single	• Listed textual metadata • Large images • Links to new searches on 'maker' field
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• None

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	N
	Object Type	N
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	N
	Significant Characteristics	N
	Material(s)	N
	Provenance	N
	Measurements	Y
	Text Transcription	N
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	N

	Object Condition	N
	Other	None
Visual Metadata		
Number or Records	0 Photographs	0 (---)
(n = 32)	1 Photograph	29 (90.6%)
	2 Photographs	2 (6.3%)
	3+ Photographs	1 (3.1%)
Complete Documentation		1 (3.1%)
Records with Scales		0 (---)
Other		
Standard Used		N
Data Quality		Good
Data Consistency		Good
References		N

Criteria	Value
Other	
Image Use Policies	Copyrighted
Ease of Use	Good
Other Notable Features	• None

5.1.7 Metropolitan Museum of Art[181]

The Metropolitan Museum of Art (Met) website is the fourth and last of those examined that has a strictly keyword-based search system, but it also has the most robust browsing system of the four to accompany it. The most desired browsing categories are present both as a starting point and to refine a search, enabling a high degree of precision in the search results and allowing users to reasonably explore a collection of over seventeen thousand Classical antiquities. Criticisms of the system are minimal, but there are two aspects that could be enhanced. First, the date ranges offered as options are very broad, with five-hundred, one-thousand, or six-thousand year spans for the Classical era, and the outside numbers were chosen to be round integers rather than significant dates. A

[181] The Metropolitan Museum of Art, *The Collection Online*, http://www.metmuseum.org/collection/the-collection-online (accessed June 17, 2014).

better method might be a double-ended slider that would allow users to select precisely the dates in which they are interested. The second issue is that the lists of browsing options, particularly under the artist/maker/culture and method/material categories, are very extensive, and it is difficult to find the desired choice quickly. A free-text field for each category in addition to the prepopulated options would allow users who know their desired term to enter it rather than scanning for it. The relatively minor nature of these modifications, however, speaks to the overall success of the current system, which though browsing-centric is ultimately effective.

The search result interface of the website serves its function well, using fairly standard conventions of image-only grids and lists with minimal textual metadata as discussed in reference to other museums above, and there is little on which to remark apart from an inability to sort the objects. The single-view design, however, requires some commentary. Much of the included metadata is in a labeled list alongside a large image of the artefact, but other information, including links to related objects, is behind a series of tabs beneath the image. Rather than loading these tabs with JavaScript, however, clicking them reloads the page from the server. This is unnoticeable when working through them, but is frustrating when trying to return to the search results, as the browser must reverse through each one. This issue damages the usability of what is otherwise a reasonable interface, and may suggest poor testing or limited technical expertise when the website was designed.

The metadata included in the records, finally, are both independently and in comparison to other websites evaluated very thin. A physical description and curatorial interpretation are rarely present; measurements are particularly poor, sometimes having

only a single dimension described; over a third of artefacts have no photographs taken, and under 20 percent have more than one, some of which include the same photograph multiple times or have an image that appears to be of an entirely different object. As a result it is impossible in many cases to establish what an object looks like with any degree of certainty. This limited level of detail would be problematic regardless of the size of a collection, but considering how many objects the Met houses and the exceptional quality of many pieces, the inability to research items remotely is a particular problem, and one that needs to be addressed.

Table 5.7: Assessment Rubric for the Metropolitan Museum of Art Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	Y
	Subject	N
	Creating Culture	N
	Time Period	N
	Object Name	N
	Material	N
	Location	N
	Feature	N
	Artist	N
	Other	None
Browsing		
Type(s)		Faceted
Categories	Time Period	Y
	Material	Y
	Culture	Y
	Location	Y
	Object Type	N
	Object Use	N
	Keyword/Subject	N
	Other	Department On View Has Images

Other		
Re-finding		Personal Collection
Language Entry		None
Query Parsing	Booleans	N
	Truncation	Y
	Stop Words	N
	Thesaurus	Y

Criteria	Value
Interface	
Search Results	
Multiple	• List of 30/60/90 records; grid of 30/60/90 records • Textual and visual identifiers; visual identifiers only • Minimal metadata; preview in grid view • Not sortable • Full on-page refinement
Single	• Categorized textual metadata • Large image with thumbnail gallery • Links to new searches on single fields • Links to related items
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• Timeline of art history and major events • Link to in-house publications

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	Y
	Object Type	N
	Material Type	Y
	Creating Culture/Person	Y
	Location	N
	Iconography	N
	Significant Characteristics	N
	Material(s)	N
	Provenance	N
	Measurements	Y

	Text Transcription	Y
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	N
	Other	None
Visual Metadata		
Number or Records	0 Photographs	751 (36.7%)
(n = 2047)	1 Photograph	908 (44.4%)
	2 Photographs	273 (13.3%)
	3+ Photographs	115 (5.6%)
Complete Documentation		453 (22.1%)
Records with Scales		54 (2.6%)
Other		
Standard Used		N
Data Quality		Adequate
Data Consistency		Poor
References		Y

Criteria	Value
Other	
Image Use Policies	Open Access
Ease of Use	Adequate
Other Notable Features	• None

5.1.8 Museum of Anthropology[182]

Of all the websites assessed, the information retrieval system of the Museum of Anthropology is rivaled only by that of the American Numismatic Society for the comprehensiveness of both its searching and browsing options. Nearly all listed options are available in both cases (see Table 5.8). Apart from keywords, all fields are selected from prepopulated lists, though for time periods there is a choice between choosing from existing historical periods or entering specific dates. The lists can be very long but are organized into alphabetical subcategories, making them reasonably easy to work through,

[182] Museum of Anthropology, *MOACAT*, http://collection-online.moa.ubc.ca/ (accessed June 18, 2014).

presuming the user is familiar with the terminology used by the site. The degree of specificity in attributed terms is very high, so that searches for vases and for vessels, for example, return entirely different sets of results, rather than the former being a subset of the latter as might be expected. Introducing a relational hierarchy between terms would allow users to suit the level of precision to their needs, and would help overcome the limitation that only one option can be selected for each search field. The browsing system has very similar setups and limitations, but the 'timeline' category in particular offers a noteworthy input system. In contrast to the broad ranges offered by websites such as the Met, the Museum of Anthropology begins with spans of up to 1350 years, but then refines these to one- to two-hundred year blocks in a second tier of options. In addition, it is not ultimately these dates that are chosen, but a dynamic list of historical periods that fall within the range selected. While this too may introduce issues of excessive specificity, tying the options to meaningful dates rather than round numbers is far more conducive to thorough recall.

The interface design for search results is less successful than the search system itself, both in its conception and implementation, which has at least one fatal bug. Artefacts are displayed in two long rows that must be scrolled through horizontally. This may perhaps have been envisioned with tangible interfaces in mind, but on a conventional computer movement through the rows requires use of the provided arrows or slider, and adjusting to the pace of either option is frustrating. More problematic, however, is that the reported number of results, to which the length of the rows is adjusted, and the actual number of results do not always match. It is unclear whether the count is wrong or if the vast majority of objects fail to load, but roughly three quarters of

the rows may remain empty, and scrolling too far results in a blank screen. The single record view of the website, meanwhile, is generally problem free, though some users may not notice the subtle ‘Cultural Context’ and ‘Physical Description’ collapsible sections on the ‘More Information’ page. Although the tabbed separation of metadata, much like the Met website, makes backtracking via the browser difficult, in this case a ‘List All’ button is provided that returns users directly to the results page, compensating for the issue.

The metadata included in records by the Museum of Anthropology is exemplary in quantity and well above average in quality, though some fields are still less detailed than they could be. As shown in Table 5.8, for textual information, well over half of the desired fields are present, including nine out of the eleven most requested. For images, under 2 percent of artefacts did not have any images, while an outstanding 94.3 percent were completely documented. This is also the only website examined that consistently uses scales in at least one image of each object. The presence of these scales compensates to some degree for the minimal dimensions included in the measurements field, but for vessels in particular more specific information on sizes would be helpful. The most noticeably vague field, however, is location, which is most frequently only listed at a country level. This imprecision is actually fairly common among the websites examined, and would not be nearly as problematic if not for the mapping functionality the Museum of Anthropology offers, which for Classical artefacts at least becomes largely unhelpful when the location is so indefinite. Despite these few matters, though, for general material this website has arguably the best metadata of any examined in this study.

Table 5.8: Assessment Rubric for the Museum of Anthropology Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	Y
	Keyword	Y
	Subject	Y
	Creating Culture	Y
	Time Period	Y
	Object Name	N
	Material	Y
	Location	Y
	Feature	N
	Artist	Y
	Other	None
Browsing		
Type(s)		Faceted
Categories	Time Period	Y
	Material	Y
	Culture	Y
	Location	Y
	Object Type	Y
	Object Use	N
	Keyword/Subject	Y
	Other	People
Other		
Re-finding		Search by ID
Language Entry		None
Query Parsing	Booleans	Y
	Truncation	Y
	Stop Words	N
	Thesaurus	Y

Criteria	Value
Interface	
Search Results	
Multiple	• 2 rows of scrollable results • Textual and visual identifiers • Minimal metadata • Sortable by date, title, artist or culture • Full on-page refinement

Single	• Categorized textual metadata • Zoomable photos and separate image gallery • Links to new searches on single fields
Other	
Comparison	• None
Visualizations	• Map of object origins
Contextual Material	• None

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Adequate
Fields	Time Period	Y
	Physical Description	Y
	Object Type	Y
	Material Type	N
	Creating Culture/Person	Y
	Location	Y
	Iconography	Y
	Significant Characteristics	N
	Material(s)	Y
	Provenance	Y
	Measurements	Y
	Text Transcription	N
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	N
	Other	None
Visual Metadata		
Number or Records	0 Photographs	5 (1.4%)
(n = 369)	1 Photograph	11 (3.0%)
	2 Photographs	174 (47.2%)
	3+ Photographs	179 (48.5%)
Complete Documentation		348 (94.3%)
Records with Scales		364 (98.6%)
Other		
Standard Used		Y
Data Quality		Adequate
Data Consistency		Adequate
References		Y

Criteria	Value
Other	
Image Use Policies	Open Access
Ease of Use	Adequate
Other Notable Features	• None

5.1.9 Museum of Fine Arts[183]

The rubric for the Museum of Fine Arts shown in Table 5.9 is accurate in listing the possible search fields and browsing categories on the website, roughly half of the options desired by scholars, but the true strengths and weaknesses of the information retrieval system are in the details of how it works. For searching, most of the available fields are free text, meaning, as discussed in reference to other websites above, that users must be able to predict the terminology in the records, increasing the barrier of entry to the system. The field the website calls 'Classification', however, encapsulating both material and object type limiters, uses a lengthy prepopulated checklist from which any number of options may be selected. Although some of the options are repetitive, unclear, or use specialized terminology, most notably 'numismatics' instead of 'coins', the ability to view and choose all items of interest from an existing list is a decided asset for precision. The browsing capabilities of the website, meanwhile, are weak in three ways: the system is single-leveled and produces very broad results; the options available for culture and subject are extremely limited; and the entry points for these categories are located on a different page than the keyword browsing, making them awkward to use.

There are also numerous issues with the interface of the search results in particular. The first is that it takes an exceptionally long time for the pages to load,

[183] Museum of Fine Arts Boston, *Collection Search*, http://www.mfa.org/search/collections (accessed June 18, 2014).

discouraging use of the limited refinement options or changing the number of results per page. In addition, although options are given to sort the results by date or by artist, these functions are broken and instead redirect to a page claiming no results were found. The textual identifiers present, finally, vary between objects, and those with the most information have the bottom lines cut off. In contrast, however, the design of the single record view is problem-free and well suited to the information being displayed. The metadata is clearly sectioned off and labeled and the images provided are large enough to study without zooming. If there is any issue, it is that like the Brooklyn Museum this website has implemented a social tagging system, but unlike the former, this website's system does not appear to have been used, at least in relation to any Classical artefacts, and the place holder for tags is thus simply dead space. This is a minor matter, however, particularly because it is unclear how long the ability to tag objects has been in place and the system may see more use in the future.

The metadata on the website is among the most thorough of the museums examined in terms of fields, with fourteen of the sixteen listed pieces of information checked off, but the consistency between records is very poor, and only a subset of the total metadata ever appears together. This might be improved if the tagging system was being actively used, but instead it is a cautionary tale of why crowdsourcing cannot replace "…reliable information based on scholarly research".[184] Visual representation is split in its quality depending on the type of object. Coins, which comprise just over half of the Classical collection, are well documented, contributing significantly to the 62 percent 'complete' rating, but far fewer of the other object types have more than a single image and can rarely be entirely studied. Alternatively, however, fewer than 10 percent of

[184] Cameron, "Digital Futures II", 250.

objects have no photographs, which is substantially better than the other large websites assessed. Overall, the Classical collection of the Museum of Fine Arts is moderately well represented online, but there is substantial room for improvement.

Table 5.9: Assessment Rubric for the Museum of Fine Arts Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	Y
	Keyword	Y
	Subject	N
	Creating Culture	Y
	Time Period	N
	Object Name	Y
	Material	Y
	Location	N
	Feature	N
	Artist	Y
	Other	Provenance Credit Line On View Has Images
Browsing		
Type(s)		Single
Categories	Time Period	N
	Material	N
	Culture	Y
	Location	N
	Object Type	Y
	Object Use	N
	Keyword/Subject	Y
	Other	None
Other		
Re-finding		Personal Collection
Language Entry		None
Query Parsing	Booleans	Y
	Truncation	Y
	Stop Words	N
	Thesaurus	N

Criteria	Value
Interface	
Search Results	
Multiple	• Grids of 16/32/64 records • Textual and visual identifiers • Sortable by date and artist (broken) • Limited on-page refinement
Single	• Categorized textual metadata • Large image and thumbnail gallery • Link to new searches on classification field
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• None

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Poor
Fields	Time Period	Y
	Physical Description	Y
	Object Type	Y
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	N
	Significant Characteristics	Y
	Material(s)	Y
	Provenance	Y
	Measurements	Y
	Text Transcription	Y
	Material Color	Y
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	Y
	Other	Scientific Analysis
Visual Metadata		
Number or Records	0 Photographs	129 (6.3%)
	1 Photograph	645 (31.4%)
	2 Photographs	1243 (60.5%)
	3+ Photographs	36 (1.8%)

Complete Documentation	1270 (61.9%)
Records with Scales	0 (---)
Other	
Standard Used	N
Data Quality	Adequate
Data Consistency	Poor
References	Y

Criteria	Value
Other	
Image Use Policies	Copyrighted
Ease of Use	Poor
Other Notable Features	• Audio recordings describing objects • Social tagging

5.1.10 Walters Art Museum[185]

The final website that was evaluated, the Walters Art Museum, has an information retrieval system that is notable in several ways. For browsing, although it is only one of four museums assessed to have a single-tiered system, it has the distinction among these of offering the most categories. It indeed offers more browsing options than several of the hierarchical or faceted websites discussed above. Unlike the Kimbell Art Museum, McMaster Museum of Art, and Museum of Fine Art, which arguably have so few categories that a more complex system is not justified, the Walters Art Museum opted for single-tiered browsing despite having metadata that could support alternative methods. The arrangement and functionality of the website's search system, meanwhile, is unique in both positive and negative ways. On the one hand, it is the only one to offer excluded terms for a wide section of fields, all of them, in fact, except for dates. On the other, however, this option is primarily available because rather than having a separate free-text input for each field, there is a single input and a checklist of the fields that should be

[185] The Walters Art Museum, *Works of Art*, http://art.thewalters.org/ (accessed June 18, 2014).

searched. Hence the options are really to use a full keyword search, a partial keyword search, or to search a single field, with a date range as a consistent second limiter. This arrangement is clearly less flexible than the alternative, and while it might be effective for a smaller collection is very detrimental to the precision of search results in this case.

The interface of both the multiple and single record views for this website are reminiscent of conventions already discussed, but there are a few aspects of the designs worth reviewing. The search results appear in a format similar to a grid view with primarily image-based identifiers and textual metadata only in mouse-over previews, but rather than having photographs of even widths and heights to create an orderly lattice, the heights vary to produce columns of differing total lengths. Aesthetically, this arrangement is modern and stylistic, but from the perspective of information comprehension it is difficult to work through, as the columns cannot be read reliably from left to right. The single record layout, meanwhile, utilizes tabbed sections for information such as description, conservation, and provenance, the presence of which becomes fairly clear in contrast when two records have different headings, but in viewing a single artefact the tabs are particularly subtle and easy to miss. Apart from this issue, however, the interface is fairly comparable to those discussed above and is well suited to the material.

There are also strengths and weaknesses to the metadata included in the website's records. On the positive side, there is no limit to the entries included in the creator or location fields, allowing, for example, the artist of a Roman artefact and the artist of the Greek piece it is based on to both be listed. In addition, this museum is unique in the study for providing not simply a statement concerning an object's condition, but a full

table listing all of the conservation measures that have been taken, a feature arguably intended primarily for staff providing, but which provides a rich context. More negatively, however, the fields and content included in each records varies enormously, some being very thorough with a lengthy description, in-depth measurements, and thorough photographic documentation, while others have single image and only three pieces of metadata. This inconsistency makes it impossible to anticipate from the search results whether any given artefact will be usable, and is harmful to the website's usability as a whole. Finally, like a few other museums discussed, the website uses social tagging to capture some of its metadata (as marked by an asterisk in Table 5.10), and the system has been used to some degree, but the content it has produced demonstrates another potential problem with unmediated contributions: a decrease in data quality. Tags such as 'awesome' and 'ouch' may express a user's thoughts and opinions, but are clearly unscholarly and cast doubt on the authority with which other tags and information can be regarded. As discussed in the next section, the use of crowdsourcing systems is a growing trend on museum websites, but one that must be used with caution.

Table 5.10: Assessment Rubric for the Walters Art Museum Website

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	N
	Keyword	Y
	Subject	N
	Creating Culture	N
	Time Period	Y
	Object Name	Y
	Material	Y
	Location	N
	Feature	N
	Artist	Y

	Other	Provenance Inscription
Browsing		
Type		Single
Categories	Time Period	Y
	Material	Y
	Culture	Y
	Location	Y
	Object Type	N
	Object Use	N
	Keyword/Subject	Y
	Other	Artist
Other		
Re-finding		Personal Collection
Language Entry		None
Query Parsing	Booleans	Y
	Truncation	N
	Stop Words	N
	Thesaurus	N

Criteria	Value
Interface	
Search Results	
Multiple	• Columns of 40-50 records • Visual identifier only • Minimal metadata on preview • Sortable by title or time period • No on-page refinement
Single	• Categorized textual metadata • Zoomable image with pop-up gallery • Links to new searches on single fields • Links to related objects
Other	
Comparison	• None
Visualizations	• None
Contextual Material	• None

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Poor

Fields	Time Period	Y
	Physical Description	Y
	Object Type	Y
	Material Type	Y
	Creating Culture/Person	Y
	Location	Y
	Iconography	Y*
	Significant Characteristics	Y*
	Material(s)	Y
	Provenance	Y
	Measurements	Y
	Text Transcription	Y
	Material Color	N
	Date of Discovery	N
	Curatorial Interpretation	Y
	Object Condition	Y
	Other	None
Visual Metadata		
Number or Records	0 Photographs	0 (---)
	1 Photograph	348 (69.6%)
	2 Photographs	29 (5.8%)
	3+ Photographs	123 (24.6%)
Complete Documentation		169 (33.8%)
Records with Scales		0 (---)
Other		
Standard Used		N
Data Quality		Adequate
Data Consistency		Poor
References		N

Criteria	Value
Other	
Image Use Policies	Open Access
Ease of Use	Good
Other Notable Features	• Social tagging • Full conservation records provided

5.2 Comparative Websites Assessments

This section will briefly discuss some of the trends across the museums examined in order to establish areas where the websites generally are and are not meeting the needs of scholars. Due to space constraints, rather than dissecting the results criteria by criteria, issues will be addressed thematically and only if they are noteworthy. The small sample size used in this study makes forming broad conclusions problematic, but the results nonetheless indicate issues that museums should be mindful of when creating their records and websites.

As discussed in Chapter 3, there were four variables along which the studied museums could be divided: whether their primary audience was scholars or the public; whether their collections were a general mix of all artefacts or specialized in one or two object types; the size of the Classical antiquities portion of their collection; and whether they were listed by participants of the user study as a resource they used. While there were no definitive conclusions along these lines, a few possible trends are worth mentioning. Those museums that are primarily scholar-focused tended to have more search options and better quality data than the alternative institutions. Larger public collections, meanwhile, were more likely to have Web 2.0 type features, including personal collections, social tagging, and multimedia data representation, though the small Kimbell Art Museum also offered audio recordings. There is a final trend concerning the consistency of data in small collections, particularly those with specialized collections, but McMaster Museum of Art and the Kimbell Art Museum, which had the most consistent data, also offered the least metadata fields overall, and it is thus unclear

whether the size of their collections or the low volume of information has a greater impact on the their consistency.

Table 5.11: Summary of Search Fields Included by Evaluated Websites

Search Field	Percentage of Websites	Percentage of Websites Excluding Keyword Only	Ranking Developed from User Study
Keyword	90	83	2
Time Period	50	83	5
Object Name	50	83	6
Material	50	83	7
Artist	50	83	10
Object Type	40	67	1
Creating Culture	40	67	4
Subject	30	50	3
Location	30	50	8
Feature	20	33	9

The individual website analyses presented above show that there are a range of search systems designs among the assessed museums, but the results across the entire sample group indicate both positive and negative proclivities. Table 5.11 summarizes the presence of specific search fields across the websites, both over all ten and over the six that were not solely keyword based, and compares them to their ranking of importance as determined from the results of the user study. 'Object type', 'subject' and 'creating culture' scored significantly below their ideal ranking, being offered by only three or four of the museums, the former two, as discussed below, likely because the appropriate metadata is not present. 'Artist', however, though not particularly important to scholars, was one of the most frequently included search fields, but there are two considerations that justify this: first, none of the museums examined collected specifically Classical antiquities, and 'artist' is likely a more important field in later time periods when the creator of a piece is commonly known; and second, many of the museums recorded a culture as the artist in the metadata when the artist was not known, making it equivalent to having 'creating culture' as a field presuming the user is aware of this fact.

Additional commonalities among the museums' search systems relate to their query parsing and foreign language entry. Most websites (70 percent) accepted some form of the Boolean operator AND as well as one of OR or NOT, but none accepted all three, and none could use them between search fields, limiting the degree of precision that could be achieved with searches. More concerning, however, were the provisions for entering foreign text. Although half of the museums studied included transcribed text in the metadata, only two could be searched using Greek characters: the Getty website using transliterated Roman equivalents, and the ANS website requiring users to change their computer settings to have their keyboard type in Greek. The remaining transcriptions were either translations or, in the case of the Walter Art Museum, were captured in a non-searchable image form, both of which negate the need to enter a foreign alphabet, but prevent searching for inscriptions. It is unclear whether the need to accommodate Greek letters was a factor in half of the museums not transcribing text into records, but across most institutions the data is either lost or irretrievable.

The browsing systems of the websites showed less thoroughness overall than the search systems in terms of what options were included. As shown in Table 5.12, even the most common categories were present in only six of ten cases, while 'object use' was not available on any. Two additional options that were not included in the user study, however, were common enough that they were incorporated into the list. 'Department' generally equates to a broader group of cultures, for example the Egyptian, Classical, Ancient Near Eastern Art department at the Brooklyn Museum, but can include alongside these specific object types such as the Numismatics department at the Met. The 'artist' category, meanwhile, along with 'keyword/subject' that was submitted by a participant in

the ‘other’ field, were by oversight not included in the official list of browsing options for the user study, but if the results of the search options question can be extrapolated, ‘keyword/subject’ would have scored high and ‘artist’ low. The most disturbing trend in browsing, however, was how few websites offered ‘time period’ as a category, as it was universally selected by user study participants and, as noted below, was consistently available in the metadata. The relative simplicity with which ‘time period’ could thus be offered as a browsing option suggests that museums may not be aware how important this category is for some users.

Table 5.12: Summary of Browsing Categories Included by Evaluated Websites

Browsing Category	Percentage of Websites Offering	Percentage of Users Requiring
Culture	60	75
Keyword/Subject	60	6
Object Type	50	69
Artist	50	No Data
Time Period	40	100
Material	40	88
Location	40	75
Department	40	No Data
Object Use	0	44

The final tally of browsing types is four faceted, four single-level, and two hierarchical. Although not universally true, those websites with faceted browsing systems tend to offer more categories and have better data separation, while two of the museums with single-level browsing had poor data separation. Questions regarding the preferred methods of browsing were not included in the user study, but may be a worthwhile area of future research. Ultimately, however, the goal of any information retrieval system is to balance precision and recall, and thus the specific method used may be less important than ensuring the available metadata is able to support it.

The trends in the metadata that museums provide for an artefact must be considered in two ways. The first is in terms of the amalgam of fields that are present across entire collections. As summarized in Table 5.13, eight of the sixteen listed pieces of information were included by under half of the websites, including three of most desired types of metadata: ‘object type’, ‘iconography’, and ‘significant characteristics’, already suggesting that many museums’ records are too thin for scholars to fully conduct their research. The second consideration is the level of reliability between records, and when this is factored in as well the analysis changes considerably. Seven out of the ten websites studied scored ‘poor’ on data consistency, meaning that not only that the level of detail in the metadata changed from artefact to artefact, but also that entire fields were present in some records and not in others. In some cases, such as ‘text transcription’, this is an understandable phenomenon, as not all objects have any text to transcribe, but the single most common example of an inconsistent field was ‘physical description’, the second most required piece of information for study participants, and one that is universally applicable to an entire collection. Generally, the only metadata that is reliably available are ‘time period’, ‘measurements’, though these vary widely in their level of detail, ‘creating culture/person’, and ‘material type’, though as Table 5.13 shows even these last two are not universal. These thin and unpredictable records are clearly not conducive to online study, and indeed do not even allow scholarly users to definitely identify artefacts that would be worth travelling to analyze in person, casting doubt on the usefulness of museum websites for academic researchers.

Table 5.13: Summary of Textual Metadata Fields Included by Evaluated Websites

Metadata Fields	Percentage of Websites Offering*	Percentage of Users Requiring
Time Period	100	100
Measurements	100	69
Creating Culture/Person	95	75
Material Type	90	75
Location	90	75
Curatorial Interpretation	80	31
Physical Description	70	94
Provenance	60	69
Object Type	50	81
Text Transcription	50	63
Material(s)	40	69
Iconography	30	75
Object Condition	30	31
Significant Characteristics	20	75
Material Color	15	44
Date of Discovery	0	38

Other significant themes in this study relate to the photographs included in online records. The summary in Table 5.14 presents the results from each of the websites studied, as well as a cumulative total, which would be the equivalent percentages if all the records were amalgamated onto a single website, and an average percentage that normalizes the scores of all ten museums in an attempt to indicate the general state. The total gives more weight to larger institutions, while the average is more evenly representative, but does not convey the wide ranges of scores, particularly for the 0-photograph and scale columns. It should also be noted that the total number of records with two photographs is skewed by object type, as over half of these are coins from the ANS and Museum of Fine Arts collections.

Table 5.14: Summary of Visual Metadata Included by Evaluated Websites

* The fields for which a museum relies solely on social tagging to provide the metadata were given a half point or 5% to reflect the uncertainty of the information's presence.

Museum	Number of Photographs				Complete	Scales	n
	0	1	2	3+			
American Numismatic Society	3916 (78.3%)	5 (0.1%)	1079 (21.6%)	0 (---)	1079 (21.6%)	0 (---)	5000
Brooklyn Museum	90 (17.6%)	147 (28.8%)	96 (18.8%)	177 (34.7%)	192 (37.6%)	16 (3.1%)	510
The Cleveland Museum of Art	11 (2.2%)	79 (15.9%)	153 (30.8%)	254 (51.1%)	361 (72.6%)	1 (0.2%)	497
The J. Paul Getty Museum	0 (---)	410 (79.9%)	50 (9.7%)	53 (10.3%)	146 (28.5%)	0 (---)	513
Kimbell Art Museum	0 (---)	23 (85.2%)	2 (7.4%)	2 (7.4%)	1 (3.7%)	0 (---)	27
McMaster Museum of Art	0 (---)	29 (90.6%)	2 (6.3%)	1 (3.1%)	1 (3.1%)	0 (---)	32
Metropolitan Museum of Art	751 (36.7%)	908 (44.4%)	273 (13.3%)	115 (5.6%)	453 (22.1%)	54 (2.6%)	2047
Museum of Anthropology	5 (1.4%)	11 (3.0%)	174 (47.2%)	179 (48.5%)	348 (94.3%)	364 (98.6%)	369
Museum of Fine Arts	129 (6.3%)	645 (31.4%)	1243 (60.5%)	36 (1.8%)	1270 (61.9%)	0 (---)	2053
The Walters Art Museum	0 (---)	348 (69.6%)	29 (5.8%)	123 (24.6%)	169 (33.8%)	0 (---)	500
Total	**4902 (42.4%)**	**2605 (22.6%)**	**3101 (26.9%)**	**940 (8.1%)**	**4020 (34.8%)**	**435 (3.8%)**	**11548**
Average Percentage	**14.3%**	**44.9%**	**22.1%**	**18.7%**	**37.9%**	**10.5%**	**---**

The first point of note is that 65 percent of artefacts overall have one or no images included in their records. This is caused by the two largest collections, the ANS and MMA, having over 78 percent and 36 percent of their respective collections un-photographed, and by half of the museums having defaulted to a single general image as their predominant method of documentation. The average percentage of single-photograph records indicates just how common this practice is, particularly among smaller institutions. Despite these numbers, however, just over a third of the records contained ‘complete’ visual representations, and could thus likely support scholarly research. While this score is low, it could be far worse, and is a reasonable starting point for future improvements. More troublesome is the shockingly low number of records that contain measurement scales. An overwhelming majority of participants in the user study

indicated the importance of these grids or rulers, yet only a single museum includes them reliably. It would be a tremendous undertaking for large museums to retroactively include scales in existing records, but in smaller collections this would be entirely possible, and all institutions could easily incorporate this practice into future documentation.

In general, the multiple- and single-record interface designs of the websites conform to a formula of an image-based grid and/or minimal metadata list view for search results, and a large image with a thumbnail gallery and metadata fields organized into either sections or tabs. Six of the museums provided some sort of contextual information, with maps of artefact locations and biographical information on artists being the most common at two each, while only two institutions offered data visualizations. The most lacking interface feature, however, was the ability to compare records. The only instance of any such provision came from the ANS website and contrasted lists of results, not individual items. Indeed the very basic metadata that is available in list views makes even incidental side-by-side comparison impossible. Considering the substantial proportion of respondents to the user study who listed a comparison interface as their first choice or one equal to a single-record view, this is a significant issue, and perhaps the most universally applicable one. Incorporating a range of visualizations, contextual information and comparison views into what is evidently the unspoken standard practices for museum website interfaces would greatly improve their usefulness.

A few additional trends across the websites are related to Web 2.0 and the growing conception of museum websites as online social spaces rather than, as MacDonald and Alsford termed them nearly twenty-five years ago, ‘information

utilities'.[186] This is a movement that is unique to public-focused institutions, and is fairly clearly oriented toward a general audience, but it has repercussions on scholarly users as well. The first indication of this phenomenon is the prevalence of social tagging systems, which were found in three of the seven museums with public primary audiences. The potential hazards of this feature, as discussed in the previous section, include relying on it to replace curator-provided metadata, and a loss of authority or data quality when the accuracy of a tag cannot be confirmed. Although such systems do have great potential to engage audiences and even enrich records, the original descriptions of artefacts must remain thorough and it should be clear whether information is coming from a qualified professional or represents an opinion. A second indication of website modernization is the inclusion of audio or video recordings, again by three of the seven museums. In theory this could be a method for including more information than can be fit within a webpage design, and for videos in particular could greatly enhance the photographic documentation, but at present the existing examples add little to textual metadata, and the production of these multimedia presentations is undoubtedly a time-consuming process that might be better sent creating more comprehensive descriptions. The final trend in this vein is the inclusion of a membership-based personal collection in which objects of interest can be stored for future reference. This functionality has clear implications for scholars who need to refer back to records repeatedly while conducting their research, and is the most positive aspect of the Web 2.0 movement.

The results of this study provide an overview of the metadata, interface designs and information retrieval systems currently included on museum websites. When examined in conjunction with the conclusions of the user study presented in Chapter 4,

[186] MacDonald and Alsford, 308.

there are discernible areas in which online collections of Classical antiquities are meeting the needs of scholars and areas where they might be improved. In the next and final chapter of this thesis, the significant issues that emerged from these studies will form the basis of a tiered set of recommended best practices. By following these guidelines when creating or revising their websites, museums will be able to create a system that adequately serves scholarly users, making them valuable research resources and solidifying a significant audience base.

Chapter 6 - Recommendations and Conclusion

This final chapter will summarize and combine the results of the studies presented in chapters 4 and 5 into a set of recommendations for how museum websites should be designed or might be improved. Rather than presenting very specific technical solutions such as resulted from the research of Dworman and Kimbrough, McKeown, and Paterno and Mancini, the suggestions in the following sections more closely model the guidelines for OPAC designs produced by the International Federation of Library Associations and Institutions, though the depth and granularity of that report will not be matched.[187] This approach has been taken to account for the widely different starting points of digital resources in cultural heritage institutions, as demonstrated both by the results of the website assessment (see Chapter 5) and by the number of institutions that were excluded from that study because their collections were not online or not searchable. The recommendations provided are presented in three tiers of importance: basic access, enhanced functionality, and supplementary additions. These levels will allow museums, regardless of their current website status, to identify and prioritize issues that should be addressed in order to improve the usability and usefulness of these resources for academic researchers.

It is important to note that while the design concepts proposed below are essential to the needs of scholars, they are not intended to universally overwrite those features

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[187] Garrett O. Dworman and Steven O. Kimbrough, "On Pattern-Directed Search of Archives and Collections", Journal of the American Society for Information Science 51, no. 1 (2000): 14-23, EBSCO (accessed November 10, 2013); Roy McKeown, "Accessing the Virtual Museum: Bringing Museum Information into Cyberspace", New Review of Information Networking 9, no. 1 (2003): 40-53, EBSCO (accessed November 10, 2013); F. Paterno and C. Mancini, "Effective Levels of Adaptation to Different Types of Users in Interactive Museum Systems", Journal of the American Society for Information Science 51, no. 1 (2000): 5-13, EBSCO (accessed November 10, 2013); International Federation of Library Associations and Institutions, Guidelines for Online Public Access Catalogue (OPAC) Displays: Final Report May 2005 (München: Saur, 2005), EBSCO (accessed November 29, 2013).

needed by other user groups. As discussed in Chapter 2, a significant body of research examining museum staff and segments of the general public already exists, and institutions might draw on such reports to supplement the points included in this thesis. It is ultimately up to each organization to establish what inclusions are appropriate based on their collections, audiences and goals. In most cases, however, the recommendations outlined below are not to the detriment of any other group, and provided that adequate resources are available, a website suitable for all users can be created.

6.1 Basic Access

The suggestions in this section represent the minimum functionality and information that a museum should strive to include on a website. They reflect both the needs of scholars and the material most frequently included online by other cultural heritage institutions in order to create a resource that meets user expectations and, for lack of better term, is competitive with the current market. Many of the more advanced features listed in later sections rely on these foundational provisions to work effectively, and it is thus vital that they be included in the groundwork of a website's design.

6.1.1 Core Metadata

As proposed in Dunmore's 'evolutionary scale' of museum websites, allowing access to collection records online, rather than just information on exhibits and the museum itself, is a vital step that "…precedes the provision of specially designed interpretation and education resources".[188] In addition to their mere presence, however, the content of these records also defines both the usefulness of a website and the information retrieval and interface features that can be supported. As discussed in Chapter 1, museums struggled to establish consistency in their documentation even when

[188] Dumore, 103.

it was paper-based and for internal use, and the results of the study presented in Chapter 5 show that this continues to be a significant issue. Instead of focusing initially on the volume of metadata included, it is therefore more important that these institutions provide a few key fields reliably in every record and with a similar level of detail. This dependability will increase the success of information recall and result in a more stable website layout, but more importantly, even if this thinner metadata will not allow users to complete their research online, it should enable them to identify with certainty artefacts that are worth visiting in person, which represents a substantial improvement on the current state of many records.

There are seven pieces of information to prioritize at this level, though some of these entail more than one field or entry. A summary of the metadata is provided in Table 6.1 below. The first field, and one often missed by museum websites, is a basic classification of what the artefact is. The categories used can be very general, for example ‘statue’, ‘vessel’ or ‘coin’, or more specific, as in ‘krater’, ‘lekythos’, and ‘amphora’, though optimally a hierarchical schema of object types and object styles will define both levels. The next pieces of metadata, the creating culture and the material of the item, can be similarly vague or precise, such as ‘Greek’ versus ‘Cycladic’ and ‘metal’ versus ‘bronze’, but again including both levels of detail increases the flexibility of the data. It should also be noted that the artist of an artefact, if known, is not equivalent to the culture and these should be in separate fields.

Describing the location of an object’s creation is also subject to gradations of specificity, from a single archaeological site to a region that spans multiple countries, but in this case the degree of certainty depends far more on the object than on a museum’s

intentions. Using consistent units for locations, for example always providing a country of origin, can increase the comparability of items and the options for searching, but this should not come at a cost of information being either inaccurate or less precise than possible. Suiting location metadata to each object and to the collection as a whole is thus preferable to a blanket policy, but some manner of geographical information should be provided.

The time period of an artefact's production, meanwhile, can be defined in several ways, each with its own benefits and drawbacks. One method is to use the conventional named eras such as 'Hellenistic' or 'Republican', which are concretely searchable and generally familiar to scholars, but limit the degree of specificity that can be achieved. An alternative is arbitrary date ranges at spans that increase precision, but these tend to split related objects into different groups, particularly around the year 1CE, which falls in the middle of critical eras. A final approach is to use independent start and end dates for each item, maximizing the detail of the metadata, but requiring more effort to research and describe. The resources available for completing records should be considered when deciding which method to employ.

The final core pieces of metadata are a physical description and simple measurements. Considering the primacy of a written description and the importance that scholars place on it (see Chapter 4), the number of records on evaluated websites that did not contain one was somewhat shocking. In addition to the general inconsistency of its presence, many museums conflated a physical description with a curatorial interpretation, resulting in informative discussions about the context of artefacts, but a limited account of what the objects themselves actually look like. Providing sufficient detail in this field

can compensate significantly for the absence of other metadata, and adequately describing an item should thus be a high priority, ideally with standards provided for the template and terminology to be used. Lastly, the dimensions of an object, at least in a general width, length and height sense (or diameter and weight for coins), should also be included. This information suffered the most on the websites assessed from poor data separation, in the worst cases being presented in a '4x3x5cm' format with no indication of which number related to which dimension. Ensuring that measurements are independently stored and properly labeled will not only increase user comprehension, but also enable the inclusion of data visualizations as an advanced feature.

Table 6.1: Summary of Core Metadata Fields

Field	Sub-Field	Guidelines
Object Type	Object Style	Controlled lists of hierarchical terms; eg. Statue → Bust
Culture	Subculture	Controlled lists of hierarchical terms; eg. Roman → Etruscan; not to be mistaken for artist
Material	Material Type	Controlled lists of hierarchical terms; eg. Clay → Terracotta
Location	---	As precise a term as can be accurately applied; possible levels: site, city, province, country, area
Time Period	---	Some manner of identifying the date of production; eg. a named period, date range or start and end dates
Physical Description	---	A standardized recounting of an artefact's appearance; not to be mistaken for curatorial interpretation
Measurements	---	The overall dimensions of an artefact; each measurement should be entered separately

6.1.2 Visual Representation

In addition to the minimal textual metadata outlined above, appropriate visual documentation is indispensible to online records. Despite the time required to thoroughly photograph every artefact in a collection, particularly a large one, providing an image of an object helps verify and supplement the written description and can substantially affect the ability of a scholar to study items online. Although there is an ongoing trend in many

museums to provide only a single picture per record, in most cases this is not sufficient to detail an artefact in its entirety. Furthermore, when multiple images are provided only inconsistently, it becomes unclear whether the back of a vase or statue was not photographed because there was nothing worth recording or due to time constraints. For an academic audience, whose interest in an object is not necessarily limited to its decoration, it should not be up to the discretion of a photographer to decide which aspects and details require documentation. Instead there must be clear guidelines that dictate a minimum number of shots, based at least in part on object type.

Those artefacts that are small and relatively two-dimensional, most notably coins, jewelry, pottery sherds and figurines, can generally be represented in two photographs. This also applies to some large but flat architectural or decorative objects such as funeral steles and frieze panels, so long as the backs and sides of these artefacts, often omitted because they are undecorated, are also documented to indicate the size and attachment points of the items. Most other objects, however, particularly vessels and statues, require between four and six photographs to present all of their angles. In addition to the issues of representing all of their sides, the tops/rims, bottoms/bases and interiors of these three-dimensional items, when photographable, can also be important for research. Finally, as the results of the user study presented in Chapter 4 make clear, it is important that at least one of the images per record contain a scale to supplement the measurements provided and contextualize the size of the artefact.

6.1.3 Information Retrieval

In order to help users locate records, the information retrieval systems on even basic websites should take advantage of as much of the included metadata as possible.

For searching, the more important activity for scholars (see Chapter 4), a keyword box alone is not an effective solution, especially if there are limited search refinement options. At minimum, there should also be fields that access the object type, time period and creating culture metadata, allowing a reasonable level of precision in the results. In any case where a limited number of terms were used to enter the metadata, the search fields should either be select boxes or otherwise indicate the available options. The browsing system should be similarly comprehensive in the categories offered, the most important being time period, material, location and culture, and all possible options for each field should be included. Provided that there is an adequate search system in place as well, an easier-to-build single-level or hierarchical browsing design is sufficient at this stage to allow users to explore the collection from numerous angles and search to obtain more precise results.

6.1.4 Identification and Comprehension Interfaces

The final considerations for creating a functional website are how the retrieved results and the metadata in a single record will be displayed. The three approaches taken by the evaluated museums for presenting search results can be summarized as: an image only, usually with a rollover preview of other information; a picture and a list of textual metadata; and a table with different fields, including a photograph, organized into columns. The results of the user study presented in Chapter 4 indicated that textual metadata is as important as images for identifying artefacts of interest, and that the intent of scholars is frequently to compare the traits of objects. As such, an image-only interface, though arguably the most visually appealing of the three, is not conducive to academic research. The goal should instead be to present as much metadata as possible at

a multi-item level without causing cluttering. A table is better for comparisons or isolating a single field of interest, but also tends to have smaller images than a list. Ultimately, for a basic website, as long as search results are navigable and the objects identifiable, users can adapt to whatever interface is used.

There are three significant notes for a single-record interface based on the tendencies of museum websites. The first is to increase legibility by keeping data fields separated, rather than burying information in sentences or paragraphs, and by labeling them. In addition, dividing different pieces of metadata into tabs can help organization but also risks preventing users from viewing fields of interest simultaneously; if the metadata being included is fairly minimal, keeping everything on a single page is preferable. Finally, an imbedded gallery of photos that employs JavaScript to switch the main image, though somewhat harder to program, is far easier to use than a page that reloads or redirects each time a new image is selected, particularly when returning to the search results. Overall, the guiding principles should be to suit the interface to the data it is presenting, and to strive for usable over modern, though the two are not mutually exclusive.

6.2 Enhanced Functionality

Once a foundational website has been created as outlined in the section above, enhancements to the features and information can be added to it as time and resources allow. In the cases of information retrieval, the proposed functionality is a replacement rather than an addition to the systems described previously, and could thus be incorporated into an initial website instead, but the added complication makes the

features more suited to be a later addition for institutions with limited knowledge and experience in website design.

6.2.1 Enriched Metadata

While continuing as much as possible to maintain consistency in the level of detail included in each record, there are several metadata fields that can be added or expanded. The first of these are tags or lists describing iconography, significant characteristics and uses of the objects. These are among the most desired pieces of information by scholarly users, but can be difficult to apply to artefacts dependably, as there is a degree of subjectivity to identifying icons and noteworthy features. As with other metadata fields, proper separation of this data will maximize its usability for information retrieval and alternative interfaces.

Another piece of information that should be added is the transcription of any text on the objects, particularly for coins. For this a decision must be made as to whether foreign letters will be recorded in their native alphabets, in Roman equivalents, or if the words and phrases will be translated into English. In each case the potential for data loss and the implications on record recall must be considered. The ideal solution is to include both a literal transcription and a translation, but this can substantially increase the time and skill required to capture the metadata.

Other valuable enhancements involve increasing the detail in fields already present, specifically for dimensions and images. Most artefacts can benefit from additional measurements, but for vessels in particular the diameters and thicknesses of rims, bases and handles can hold valuable information about the origins and production of the objects, and despite the time required to gather such data, it is thus well worth

including.[189] A final addition is to include images that reflect the increased metadata by depicting details such as the various icons and features described, ideally with scales included to indicate their size. This will result in records that should serve the needs of most scholars and allow them to conduct their research primarily online.

It is notable that while existing metadata standards such as CDWA and CIDOC-CRM do not cover visual metadata, and are overly general in the requirements for dimensions, they do call for all of the written metadata outlined in this section and section 6.1.1 above.[190] The issue remains, however, that such guidelines are not being employed in cultural heritage institutions, due at least in part to the specialized knowledge needed to understand and implement them. When training in these standards becomes required for curatorial and registrar staff and their use increases, they may result in records that are adequate for academic users, but until such time, it is hoped that the less technical suggestions outlined here will be better adopted by the museum community.

6.2.2 Augmented Information Retrieval

Ensuring that the searching and browsing options expand to take advantage of new metadata fields is the minimal adjustment required for information retrieval system iterations. For transcribed text this may involve introducing a method for entering foreign alphabets. The way this is to be accomplished naturally depends on how the text was stored, but instructions should be provided to users regardless of the approach. Guides for Roman-equivalent letters should be provided if transliteration was used, while ideally an

[189] For an example of how extensive the measurements of vessels are in academia, see J.N. Coldstream, L.J. Eiring and G. Forster, "Knossos Pottery Handbook: Greek and Roman", *British School at Athens Studies* 7 (2001): 1-178, JSTOR (accessed July 6, 2014).

[190] Getty Research Institute, *Categories for the Description of Works of Art* (2014); International Council of Museums, *Definition of the CIDOC Conceptual Reference Model*, version 5.1.2 (2013).

internal feature of the system should enable entry of Greek or other foreign characters rather than relying on a user's system settings as in the ANS website (see Chapter 5).

In addition to this expansion of options, however, there are also more drastic changes that can be made to information retrieval systems to increase their precision and recall. The first is to introduce faceted browsing, allowing users to narrow down results by any number of categories in combination. There are numerous examples of this in the websites examined in Chapter 5. For searching, meanwhile, implementing an autocomplete or suggestion function for free-text fields will help ensure that the terminology entered matches that in the records and thus that results are actually returned. In addition, there are any number of ways to improve query parsing, including allowing Booleans or the equivalent within and between search fields, and developing a thesaurus to capture equivalent terms in records.

6.2.3 Comparison Interface Features

One of the most-consistently missing features from museum websites is a capacity for record comparisons. The results of the user study indicated that comparing items is one of the main intentions of scholars and that a view enabling this activity was strongly desired (see Chapter 4), yet only one of the websites examined had any provisions for side-by-side assessments, and this was at the level of search results, not individual records. There are several ways in which comparisons can be assisted, some of them requiring more technical skills and others more hands-on research. Perhaps the simplest method, assuming that the metadata included in records is sufficient, is to provide links in the records to new searches and related objects, allowing users to identify and assess similar items sequentially. An associated, though far more labour-intensive

approach is to push this concept beyond an internal collection and offer references to analogous artefacts in other museums. To genuinely facilitate comparisons, however, there must be an interface that presents the metadata from multiple objects simultaneously. This type of layout has become very common on commercial websites to contrast the features of electronics or services, but it has not yet been incorporated by cultural heritage institutions. As a progressive design addition, however, such a capability would be an asset for academic researchers.

6.3 Supplementary Additions

This section suggests advanced features that go beyond representing artefacts online, and provide information and abilities that might not be possible even in person. They require a degree of technical skill or research time that may make them impractical for museums with limited resources. For those institutions that are able to pursue them, though, they would greatly enhance the online experience of scholarly users.

6.3.1 Contextual and Analytical Metadata

As discussed above, a thorough description of an artefact, including investigation into the time and place of its origin, can support many types of scholarly inquiry. There are, however, research questions that require information not contained in an object's physical appearance. For cultural heritage artefacts in particular, the context in which an item was found, meaning its location relative to structures and other objects, can be vital to determining its history and identifying larger trends. As Hoopes discusses, the amount of material that is potentially relevant is massive:

> *An archaeological dig, for example, can generate thousands of pages of supporting documentation. This includes maps, level plans, sketches, field notebooks, excavation forms, photographs, correspondence, and even the published and unpublished site reports, graduate theses, articles, and monographs that result from this research. Add to these hundreds of photographs*

> *(in formats ranging from glass negatives to color transparencies), film footage, video, and even audio interviews and one is faced with an overwhelming, but invaluable mountain of primary data of interest to both scholars and the general public.*[191]

In addition, the availability of much of this information is subject to forces outside of museums, such as whether archaeological groups retained it when excavation was complete or are willing to make it public. Nevertheless, devoting resources to curating and digitizing such ancillary information when it is possible would be a significant asset to any museum website.

Another form of data that can be provided is the results of scientific analyses performed on the artefacts to reveal aspects of their nature that cannot be determined visually. There are several examples of museums conducting such tests to establish the chemical makeup and origin of an object's raw materials. As noted in Chapter 5, the Museum of Fine Art has included the results of tests on stone objects in their online records, while the Museum of Antiquities at the University of Saskatchewan has taken advantage of the local Canadian Light Source synchrotron to analyze several ancient coins and glass vials.[192] There are also instances of archaeometrical studies successfully determining the former contents of vessels and structures by testing the residues remaining on their interior surfaces.[193] The inherent expense of such experiments, and the technical expertise required to interpret the results, means these projects are a luxury available to few institutions, but making such valuable data available might be considered as a long-term goal.

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[191] Hoopes, 93.

[192] Mark Ferguson, "Old Meets New: CLS Used to Examine Museum Coins" (March 26, 2010), *On Campus News*, http://words.usask.ca/archived_ocn/10-mar-26/index.php (accessed July 13, 2014).

[193] See for example: Alessandra Pecci, Miguel Angel Cau Ontiveros and Nicolas Garnier, "Identifying Wine and Oil Production: Analysis of Residues from Roman and Late Antique Plastered Vats", *Journal of Archaeological Science* 40, no. 12 (2013): 4491-4498, EBCSO (accessed July 13, 2014).

6.3.2 Interactive Images

There are several ways in which the visual representation of an object might be augmented by adding new media or by increasing the functionality of existing images. The benefit of these measures, however, is highly dependent on the object at hand. The x-ray films provided for a few artefacts by the Brooklyn Museum, for example, unveils information about the interior of an item that is otherwise inaccessible, but there are relatively few cases where such internal components exist. Another advanced feature, requiring very specific technology and software, is to offer three-dimensional recreations of artefacts. The research of Hess et al. has demonstrated the viability of rendered scans to "…extend beyond the limitations of the traditional 2D photograph…", but in addition to the time and resources required, the success of the models varied with the size and material of the object being scanned.[194]

Modifying the interface for photographs is more generally beneficial, but is especially significant for large and many-sided artefacts. Spatially connecting images to imitate a rotatable or zoomable cube, for instance, can indicate how multiple images are associated to one another, and is a simpler if less accurate version of three-dimensional rendering. A related concept is to flatten multiple photographs into a single continuous image, as was done recently, in an extreme example, to produce a nearly two-hundred-metre long recreation of the frieze from Trajan's Column.[195] A final interactive possibility, as suggested by a participant in the user study (see Chapter 4), is to apply image-mapping techniques to photographs and attach descriptions to particular areas. The purpose of this functionality is to connect the textual metadata to the pictures, clarifying

[194] Hess et al., 194; 207.

[195] Silvia Donati, "The Trajan's Column as You've Never Seen It Before" (July 1, 2014), *Italy Magazine*, http://www.italymagazine.com/trajans-column-youve-never-seen-it (accessed July 11, 2014).

what the image contains and what the text describes. Each of these features has unique technical complications to overcome, but they are viable ways improve the usability of existing photographs.

6.3.3 Alternate Views

There are also additions that can be made to the interface design of a website that are not related to images. The results of the user study as presented in Chapter 4 showed overwhelmingly that scholars would make use of contextual materials and data visualizations were they provided, but the inclusion of such features by museum websites was mixed. As noted above, for cases such as maps and graphs the ability to implement these interfaces successfully is tied to the presence and separation of specific metadata, and this may be a factor in why many websites do not include them. If a foundation of consistent and thorough records has been developed, however, there are several possibilities for providing distant views of the information.

One of these is to use geographic information system (GIS) technology to map the locational data of one or more records. This might involve plotting a single piece of metadata, such as location of production, for numerous objects in order to compare them, as is the case on the ANS and Museum of Anthropology websites (see Chapter 5). For those artefacts where extensive provenance information is available, the movement of the item over time could also be displayed. The artist fields in records can be contextualized as well, as shown on the Getty and the Kimbell Art Museum websites, by providing biographical details such as dates and places of activity, examples of their work, and any textual references to them that might exist.

For visualizations, meanwhile, there are two types that might be considered. The first is to incorporate graphing capabilities that allow users to compare items based on set criteria. The most obvious example of this is dimensions, due to their numerical values, but plotting counts of artefacts against time spans or locations is also possible. Finally, the relationships between objects can also be visualized using graph database software. An ongoing open source project by the CulturePlex Lab at the University of Western Ontario called SylvaDB provides an easy to use system for building and querying a graph database, and could even allow users to create their own artefact relationships.[196] These advanced interfaces are valuable independently, but can also be combined to further expand the possibilities for exploring a collection.

6.3.4 User Accounts

Creating an opt-in account system to recognize users opens up several opportunities for increased functionality. Personalized collections are a common instance of this, and half of the museums in the website evaluation presented in Chapter 5 have included such functionality. In addition to assisting users in re-finding an object, these self-curated digital exhibits are also beneficial for research activities, as a study by Marty suggests.[197] The features of these personal collections can vary from simply presenting selected artefacts on an account page to allowing the user to expand and change the information in the records with their own private notes. The latter case may require a substantial modification of the backend of the website, but would greatly enhance the utility of the system. An additional capability of accounts is to store preferences for information retrieval and result interfaces, increasing the efficiency with which users can

[196] *Sylva*, http://sylvadb.com/ (accessed July 11, 2014).
[197] Marty, "My Lost Museum", 216.

search for and identify objects of interest. The associated ability of museums to quantify return visitors through logins and activity makes these account systems beneficial for both users and institutions.

6.3.5 Usability Testing

A final recommendation for museum websites, which can be applied to even basic designs, but is particularly important for large and more complex systems, is to perform regular user testing in order to improve functionality and usability. There are numerous existing reports outlining how these tests might be completed, including the work of Cunliffe et al., which evaluates the utility of several approaches to determine when each should be used.[198] As shown in Chapter 4, usability can be a significant factor in whether scholars consider a website useful for their research, and determining the effectiveness of a design is thus important to long-term success. While there are general principles that can be followed, usability is ultimately specific to each website, and testing needs to be performed locally. Establishing an iterative schedule of increasing functionality and evaluating the results will help ensure that user expectations are consistently met.

All of the recommendations above, but in particular this one, should make it clear that designing and implementing a website cannot be, as Hertzum puts it, a 'fringe activity' performed by staff members outside of their normal responsibilities, nor can it be a one time contract to an external organization that has a concrete project end date.[199] Developing online resources and ensuring that they are adequately serving the needs of all users is an ongoing process that require dedicated staff. While this is clearly not

[198] Cunliffe, Kritou and Tudhope; see also Vilar, Filgueiras and Rebelo.
[199] Hertzum, 131.

possible for all institutions in a climate of recession and budget tightening, it should be part of the long-term plans of all museums.

6.4 Conclusion

Despite the longstanding historical relationship between scholars and museums, in recent years, alongside efforts to digitize records and a shift towards user centricity, there has been a tendency to dismiss academic researchers as an irrelevant audience of these institutions. Authors in the museum studies community have declared that there is no significant difference between scholars and curators, and that academics comprise a diminutive portion of online visitors, and are thus not worth considering. As a result of these unfounded conceptions, there has previously been little examination of the habits and needs of this user group when accessing artefacts digitally. The research presented in this thesis has been an effort to rectify this state as it pertains to a finite set of academics that use a very specific type of museum collection: Canadian doctorate holders examining Classical antiquities.

The results of the two studies completed for this investigation demonstrate both what scholars want in a museum website, and the degree to which this is not currently being provided. Academic users require extensive primary data on the origin and physical properties of artefacts, as well as thorough photographic documentation. For information retrieval, options that mimic and diverge from traditional museum classifications are equally valuable, while interface designs should allow both distant and close examinations of objects. Some of the more prominent concerns that scholars have with current digital resources are the quality, accuracy and consistency of metadata, the presence and content of images, and the appearance and ease of use of designs. While the

suitability of individual museum websites on these fronts differs widely, in general there are pervasive issues across the online catalogues of cultural heritage institutions housing Classical materials. The metadata in records is unstandardized and inconsistent, there are often not enough images to thoroughly document an artefact, and the information included for many objects is too thin to support academic inquiry. The available interfaces do not allow scholarly users to perform the types of comparison and trend-finding activities their research requires, and the options for locating objects of interest are limited even in the best cases. Overall, either because they are unaware of the needs of academic users or because they are disinclined to address them, most museum websites are failing to adequately serve their scholarly audiences.

Based on these results, the recommendations proposed above outline a tiered system of priorities in which most museums, regardless of the current state of their websites, can identify areas where they might better serve academic users by altering their records and designs. The three levels, basic access, enhanced functionality and supplementary additions, build upon each other to progress from allowing users to locate items worth studying on a physical visit, to being able completing their research online, to finally surpassing the information and capabilities that are available in person. While many of the more advanced recommendations provided are beyond the resources of smaller institutions, the goal of these suggestions is not to set a uniform standard which all museums must meet, but to provide guidelines of how they might serve an academic audience to the best of their abilities. Scholars are a unique and significant user group of cultural heritage institutions, and their information needs and information-seeking behaviour should be acknowledged in the design of museum websites.

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Appendix A – Survey Questions

1. Which of the following do you consider to be your area of study? (Check all that apply)

- ☐ History and Classics
- ☐ Art History
- ☐ Archaeology
- ☐ Other (please list): _____

2. Which of the following types of Classical artefacts have you used in your previous research? (Check all that apply)

- ☐ Coins
- ☐ Pottery or vessels
- ☐ Statues or figurines
- ☐ Tools, implements or weapons (including weaving equipment)
- ☐ Architectural structures or decorations
- ☐ Religious/ceremonial items
- ☐ Personal Items (eg. jewelery)
- ☐ Other (please list): _____

3. Select the Classics-related time periods and/or geographical areas you have studied in your previous research (check all that apply). Note that for simplicity only the broadest categories have been included.

Greek

- ☐ Neolithic Period (7000-3000 BCE)
- ☐ Early Bronze Age (3000-2000 BCE)
- ☐ Middle Bronze Age (2000-1600 BCE)
- ☐ Late Bronze Age (1600-1100 BCE)
- ☐ Dark Age (1100-700 BCE)
- ☐ Archaic Period (700-480 BCE)
- ☐ Classical Period (480-323 BCE)

Hellenistic Period (323-146 BCE)

- ☐ Macedon/Anatolia
- ☐ Egypt
- ☐ Syria/Mesopotamia

Greco-Roman Period (146-30 BCE)

- ☐ Greece
- ☐ Egypt

Roman

- ☐ Etruscan/Dynastic Period (before 500 BCE)

Republic (500-50 BCE)

- ☐ Italy
- ☐ Corsica/Sardinia
- ☐ Greece/Asia Minor
- ☐ Spain
- ☐ Gaul
- ☐ Africa

Imperial Era (50 BCE – 476 CE)

- ☐ Italy/Corsica/Sardinia
- ☐ Gaul
- ☐ Spain
- ☐ Britain
- ☐ Greece/Macedonia
- ☐ Northern Africa
- ☐ Egypt
- ☐ Asia Minor

☐ Other (please list): _____

4. In your previous research have you used any digital resources such as websites, databases or downloads to locate or study artefacts?

- ◯ Yes
- ◯ No

5.
[Original Positive]: List any digital resources (websites, databases, electronic catalogues, etc.) that you have used to access artefacts for research in the past, and what, if anything, you found helpful about them. You may identify the resource by URL, organization name, and/or resource name.
[Revised Positive]: List any digital resources that you use regularly to access artefacts for research, and what you find useful about them (eg. size of collection, easy to search, quality of information).
[Negative]: Please describe the reason(s) you have never used digital resources for artefact research.

6.
[Original]: Describe your process, in general, for locating and using Classical artefacts in your research, either digitally, physically, or both.
[Revised]: When you search for Classical artefacts, whether digitally, textually or at a museum, what are the purposes of your search? Examples might include 'to find comparisons for a known object' or 'to find artefacts with a particular subject'.

7. If, while using a digital resource, you needed to enter information in Greek, would you prefer to use an on-screen Greek keyboard or to type in Roman-alphabet equivalents (eg. W = Omega, Q = Theta)?

- On-screen Greek keyboard
- Roman-alphabet equivalents
- Roman-alphabet equivalents if a translation guide were provided
- I would prefer to have both options
- I never enter information in Greek

8. Have you ever used artefacts in your research that might require an alphabet other than Roman/English or Greek to describe?

- Yes (please list language(s)):
- No

9. When using a digital resource to locate and research Classical artefacts, how much of your time do/might you spend browsing through the resource, and how much searching for specific traits/objects? Split the options out of 100% (ie. 60/40).

- [ ] Browsing
- [ ] Searching

10. If you were browsing through a digital collection, which organizational schemas might you find helpful? (Check all that apply)

- [ ] By time period
- [ ] By culture
- [ ] By material
- [ ] By object type (bowls, rings, etc.)
- [ ] By object use (cooking, weaving, etc.)
- [ ] By location of creation/discovery
- [ ] Other (please list):

11. When performing a search for artefact(s) in a digital resource, how often do/might you use the following delimiters? Note that more than one could be used in a single search.

	Never Use	Use Infrequently	Use Regularly	Use Consistently
By specific artefact name (eg. Venus de Milo)	○	○	○	○
By artist's name	○	○	○	○
By location of origin (eg. Athens, Gaul)	○	○	○	○
By creating culture (eg. Greek, Roman)	○	○	○	○
By time period of origin (eg. 4th Century BCE, Late Imperial)	○	○	○	○
By object type	○	○	○	○
By material (eg. ceramic, metal)	○	○	○	○
By subject or figure (eg. Trojan war, Julius Caesar)	○	○	○	○
By feature (eg. border, handle)	○	○	○	○
By keyword	○	○	○	○
Other (please list):	○	○	○	○

12. In reference to the last question, how many delimiters do/would you tend to use in a single search, in general?

- ◯ 1-2
- ◯ 3-4
- ◯ 5 or more
- ◯ Too inconsistent to determine

13. When entering information into a search box to locate artefacts in a digital resource, do/would you tend to use:

- general terms (eg. pottery, coins, sculpture);
- technical terms (eg. lekythos, denarius, frieze); and/or
- descriptive terms (eg. red-figure, Athenian owl, marble relief)?

Grade each type of search term on how likely you are to use them when searching, 1 being unlikely and 6 being very likely.

	1 (unlikely)	**2**	**3**	**4**	**5**	**6 (very likely)**
General Terms	◯	◯	◯	◯	◯	◯
Technical Terms	◯	◯	◯	◯	◯	◯
Descriptive Terms	◯	◯	◯	◯	◯	◯

14. When examining a list or table of search results, would it be more helpful to view text, images or both?

- ◯ Text
- ◯ Images
- ◯ Both
- ◯ No preference

15. Based on the ways you have used artefacts in previous research, rank the following information presentation methods in order of how useful they would be, 1 being most useful and 3 being least useful.

- 1 ⇕ Single Artefact Description
- 1 ⇕ 2-3 Artefact Comparison
- 1 ⇕ Table of Numerous Artefacts
- ☐ All are equally useful
- ☐ None are useful for my research

16. Which, if any, of the following categories of artefact information do you consider important for your research? (Check all that apply)

- ☐ Physical Description
- ☐ Significant Characteristics
- ☐ Object Type (bowl, ring, etc.)
- ☐ Measurements (weight, diameter, etc.)
- ☐ Iconography
- ☐ Photographs/Drawings
- ☐ Text Transcription
- ☐ Object Condition
- ☐ Location of Discovery - General (Country/Province)
- ☐ Location of Discovery - Specific (City/Site)
- ☐ Curatorial Interpretation (eg. possible purpose of artefact)
- ☐ Provenance
- ☐ Creating Culture (Etruscan, Mycenaean, etc.)
- ☐ Time Period
- ☐ Date of Discovery
- ☐ Material(s) (ceramic, metal, etc.)
- ☐ Material Color
- ☐ Material Type (coarse ware, silver, etc.)
- ☐ Other (please list):
- ☐ None are useful for my research

17. Would you prefer that related artefacts, for example a set of tools, be described and presented individually or as a set?

- ○ Individually
- ○ As a set
- ○ No preference

18. Would you make use of secondary or contextual material, such as maps, definitions, or brief biographies, if they were present in a digital resource?

- ○ Yes
- ○ No
- ○ Unsure

19. Would you make use of visualizations, for example graphs comparing weights, if they were present in a digital resource?

- ○ Yes
- ○ No
- ○ Unsure

20. What information, if any, do you find is missing from artefact descriptions or wish were present?

21. Which of the following options best represents your opinion towards images of artefacts in a digital resource?

- ◯ I don't care about them
- ◯ I appreciate when they're present, but don't require them
- ◯ It is difficult to perform my research without them
- ◯ I hesitate to use artefacts digitally if images are not present

22. Do you consider general images or images of details to be more useful to your research?

- ◯ General images
- ◯ Images of details
- ◯ Both are equally useful
- ◯ Neither is useful

23. Do you consider measurement scales to be important components of images?

- ◯ Yes
- ◯ No
- ◯ Only in detail images
- ◯ Only for specific types of artefacts

(please list types):

- ◯ Uncertain

24. Is the ability to download and/or reproduce (under a creative commons license) images of artefacts important to you?

- ◯ Not important
- ◯ Somewhat important
- ◯ Very important

25. Are there any other comments or notes related to digital resources of Classical artefacts that you would like to include?

Appendix B – Website Assessment Rubric

Criteria	Sub-Criteria	Value
Information Retrieval		
Searching		
Fields	Object Type	Y/N
	Keyword	Y/N
	Subject	Y/N
	Creating Culture	Y/N
	Time Period	Y/N
	Object Name	Y/N
	Material	Y/N
	Location	Y/N
	Feature	Y/N
	Artist	Y/N
	Other	List
Browsing		
Type		Single/Hierarchical/Faceted
Categories	Time Period	Y/N
	Material	Y/N
	Culture	Y/N
	Location	Y/N
	Object Type	Y/N
	Object Use	Y/N
	Keyword/Subject	Y/N
	Other	List
Other		
Re-finding		URL/Search By ID/ Personal Collection
Language Entry		Method
Query Parsing	Booleans	Y/N
	Truncation	Y/N
	Stop Words	Y/N
	Thesaurus	Y/N

Criteria	Value
Interface	
Search Results	
Multiple	• Number and layout of records • Textual or visual identifiers • Amount of textual metadata • Sorting of records • Refinement of records

Single	• Display of textual metadata • Display of visual metadata • Links to new searches • Links to related records
Other	
Comparison	List
Visualizations	List
Contextual Material	List

Criteria	Sub-Criteria	Value
Item Records		
Textual Metadata		
Data Separation		Poor/Adequate/Good
Fields	Time Period	Y/N
	Physical Description	Y/N
	Object Type	Y/N
	Material Type	Y/N
	Creating Culture/Person	Y/N
	Location	Y/N
	Iconography	Y/N
	Significant Characteristics	Y/N
	Material(s)	Y/N
	Provenance	Y/N
	Measurements	Y/N
	Text Transcription	Y/N
	Material Color	Y/N
	Date of Discovery	Y/N
	Curatorial Interpretation	Y/N
	Object Condition	Y/N
	Other	List
Visual Metadata		
Number or Records	0 Photographs	Number
	1 Photograph	Number
	2 Photographs	Number
	3+ Photographs	Number
Complete Documentation		Number
Records with Scales		Number
Other		
Standard Used		Y/N
Data Quality		Poor/Adequate/Good
Data Consistency		Poor/Adequate/Good
References		Y/N

Criteria	Value
Other	
Image Use Policies	Copyrighted/Open Access/None
Ease of Use	Poor/Adequate/Good
Other Notable Features	List