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Studies show that art historians and other image professionals value being able to search for images using subject terms. However, the subject indexing of artworks and images is a subjective and time-consuming undertaking. As a result, many digital image collections are lacking comprehensive subject access points at the object level. Social tagging of digital images has been proposed as a means of improving image metadata and increasing subject access to art images. Three social tagging projects, Steve.museum, the Brooklyn Museum Posse, and Art UK's Your Paintings Tagger, were created as test programs to explore issues regarding the social tagging of digital images in museum collections. Their results suggest that carefully designed tagging programs can improve access to art images when used as a supplement to professional indexing.

Headings:

    Tags (metadata)

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    Digital libraries

A REVIEW OF SUBJECT INDEXING AND SOCIAL TAGGING PROJECTS IN ART
MUSEUMS.

by
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I. Introduction

Visual surrogates of art objects, in the form of photographic reproductions, have

existed since the invention of photography in the nineteenth century. Photographic

reproductions have been essential to the work of art historical scholarship for as long as

they have been available. The development of photographic technologies and their

widespread use led to the possibility of large collections of art images, which Andre

Malraux enthusiastically described as the "museum without walls." Malraux and other art

amateurs saw the potential of photographs to revolutionize our understanding of art

history by allowing for the immediate comparison, within one study or library, of

different works of art from far-flung collections. How much greater is the potential of our

new virtual museums, where any number of art works from collections around the world

are available in an instant to a scholar as long as the correct search terms are used?

For most of the twentieth century and into the beginning of the twenty-first, scholars

and teachers seeking high-quality images of art and architectural monuments relied on

slides or photographs, either from the scholar's personal collection or from museum and

departmental slide libraries and photographic archives. In these institutional settings,

researchers would work with a knowledgeable librarian or curator who could provide

detailed research assistance and access to relevant images. The traditional image archive

was a physical collection with an individual and even idiosyncratic approach to indexing

and access. These physical, analogue image collections have largely been made obsolete

by the digitization of slides and photographs and the rise of the internet as a dominant research tool. And while slide libraries have been instrumental in digitizing slides and photographs, they have largely been subsumed by the web, subscription-based services like Artstor, and other digital libraries when it comes to access. Most museums now have an online presence and a method for search and display of images from their collections. In this new image ecosystem, instead of knowledgeable librarians managing access and providing personal research assistance, researchers now rely on metadata, indexing, and database searching to access images, with much of the work of indexing and collection management taking place behind the scenes. Digital libraries, therefore, have to ensure that their object records contain metadata that is accurate and sufficient to make images discoverable, and are still improving their tools for providing access. Finding better ways to provide access to good quality, relevant images of art and architecture is therefore of utmost importance and has been a decades-long project.

Subject indexing has been frequently left out of indexing in museums and other image repositories because of the time and intellectual labor required to determine subject access points for non-textual images. However, what if users want to be able to locate images based on subject? What if providing subject access to art images not only helps open up whole new areas of research in the humanities, but also helps museums and cultural institutions to invite their audiences to engage with collections in meaningful new ways? Some researchers have been pursuing strategies for streamlining, standardizing, and even automating subject indexing for images. This paper considers some of the experimental projects in social tagging in which public and volunteer users provide access points for images in art collections through contributing tags, creating in

the process new subject terms that may not match up with the types of terms created by

professional indexers.

II. Literature Review

a) Image Metadata and Subject Access

While the application of subject terms to text-based sources is something that has been a part of library bibliographic cataloging since the advent of formal cataloging systems, representing the content of visual images with words is more difficult than for text-based objects. Intellectual control is a challenge because assigning subject terms to works of visual art is subjective, and often involves an interpretive process. The content of an image is rarely clear or straightforward, and there can be many layers to the subject of an image. The establishment of standards and schema for the subject classification of art objects and visual resources has therefore lagged behind the development of standards for books and other text-based objects.

Art historians have long had categories for art works, not so much as practical index terms but as conceptual approaches to art history and theory. Paintings were classified into genres, for example. The major genres for painting include still life, portraiture, and history painting, and these were codified in the art academies of the seventeenth and eighteenth centuries. Erwin Panofsky's *Studies in Iconology* (1939) is frequently cited in library literature as the first systematic discussion of classification by subject matter. Panofsky's system distinguished three layers of subject matter identifiable in artworks: *pre-iconographic*, *iconographic*, and *iconological*. The pre-iconographic, or "natural,"

subject is instantly readable in the image. This pre-iconographic subject is not dependent on any historical or cultural knowledge, and does not require interpretation beyond the learned psychological process that helps us to see, for example, a green patch of paint as a tree. Panofsky's iconographic, or conventional, meaning requires some knowledge of iconography, or generally known cultural idioms, to recognize higher-level subject matter. Thus, a viewer with knowledge of biblical stories will be able to interpret the iconography of the image as denoting the Tree of Knowledge in the Garden of Eden, to extend the example. Finally, iconology takes interpretation a step farther, constituting the meaning of the work of art. So, the Tree of Knowledge might iconologically signify a biblical or moral concept, such as original sin, or temptation, or some other higher-level concept that will inevitably rely on a subjective interpretation.

Image metadata in museums and other image catalogs has tended to follow art historical models of basic identifying information, so that art images have primarily been classified by attributes other than subject matter. This identifying information is known as the label text (sometimes referred to in art history classrooms as the "tombstone"), which consists of title, artist, date of creation, medium, dimensions, and location. This label text was usually created with curatorial and museum priorities in mind and is a throwback to the days of museum work before the internet. The subject and other visual descriptors are not usually included in this basic cataloguing information. Nevertheless, there have been steady attempts to facilitate subject access to art through the development of standard vocabularies and schema.

Corinne Jörgensen, in her 2003 book *Image Retrieval: Theory and Research*, describes the history of systems of access to images, and the roadblocks that the visual

resources professional community has encountered when considering the challenge to standardize visual resource indexing. Before the advent of digital image access, image collections were local systems with their own methods of classification driven by the content of the collection, "data-up", in Jörgensen's phrase.

In a 2007 survey of image studies, Joan E. Beaudoin argued that the state of standardized subject indexing had not advanced much, finding that there was still little agreement about what information would be most helpful to users of visual materials. As a result, she warns, "most collections of cultural materials and their visual surrogates remain, at least in part, un-indexed in the basic sense" (p. 24). There were, however, a number of visual description standards being developed, and the issue was beginning to be the problem of having to choose among competing standards and systems, rather than having no standards at all.

An early and important scheme for describing content of images was Iconclass, based on a Dutch art historian's ideas in the 1950s for a systematic overview of art subjects and themes, which was further developed, codified, and published by a team of researchers in the 1980s. Iconclass organizes subject terms into a hierarchical schema with a numbered classification system. Like Panofsky's scheme, Iconclass did not originally account for abstract art, although a category for non-representational art was added in 1996. Its nine primary categories include traditional art historical designations of subject matter or 'genre', but have since been updated so as to be more inclusive. The categories are

    0 Abstract, Non-representational Art
    1 Religion and Magic
    2 Nature
    3 Human being, Man in general
    4 Society, Civilization, Culture
    5 Abstract Ideas and Concepts

6 History
7 Bible
8 Literature
9 Classical Mythology and Ancient History

Art historians designed Iconclass, with art historians and museum professionals in mind. Its primary categories closely mirror the ways that art has been categorized by experts, from Salon reviewers of the eighteenth century to traditionally trained art historians and connoisseurs today. And while the categories may appear straightforward, the genre distinctions (i.e., where "History," "Literature," and "Classical mythology and Ancient History," for example, are divided into separate categories) may not make intuitive sense to a user without a background in art history. Iconclass therefore provides an illustration of the frequently cited "semantic gap" in indexing language.

An early document in library professional standards for image indexing was Elisabeth W. Betz' *Graphic Materials: Rules for Describing Original Items and Historical Collections*, which appeared in 1982. Compiled as a supplement to the Anglo-American Cataloging Rules (AACR), Betz' rules addressed the cataloging of visual materials, but included only a brief instruction to include "an objective narrative summary of a collection or for clarification of the content, meaning, or iconography of a single item" (Betz 1982, 64).

Contemporary works, like contemporary viewers, do not rely on the same conventions and iconography as the renaissance painting that Panofsky had in mind when he conceived of his scheme. And, of course, abstract or non-representational art will present whole new problems of subject classification. However, despite the somewhat narrow art-historical outlook of Panofsky's system, it has nevertheless served as the

conceptual scaffolding for more practical indexing methods recommended in recent library literature. Sara Shatford Layne, especially, has developed a theoretical framework for subject cataloging of images based on Panofsky's work. Layne has argued for a faceted strategy when designing content description standards and search interfaces. In a 1994 article, Shatford Layne considered the purpose of subject indexing of images, concluding that subject indexing should be able to provide (1) access to individual images, and (2) useful *groupings* of images. Groupings of images are useful for users who don't have a particular image in mind but are instead looking for thematic occurrences or other topics of interest in art images they may not yet be aware of. These two goals of image retrieval are best accomplished if repositories are able to apply subject terms to image metadata in a clear and organized way.

VRA Core, developed by the Visual Resources Association, was another major step forward for the systematization of image indexing. Described as "a data standard for the description of images and works of art and culture," it is based on the bibliographic Dublin Core Metadata Element Set and simply defines the essential elements of an art object or image metadata record, which does not, however, require subject descriptors. The guidelines elaborated in *Cataloguing Cultural Objects: A Guide to Describing Cultural Works and Their Images* recommend the indexer to record subject terms "for all works and images, even those that have no narrative or figurative "subject matter" in the traditional sense."

The development of controlled vocabularies has been essential to the professional subject indexing of images. The Getty Research Institute has been at the forefront of the development of controlled vocabularies for the cataloguing of information related to art,

architecture and other material culture. Controlled vocabularies have allowed for a systematic approach with regard to subject classification, fostering uniformity and interoperability across a wide variety of collections and disciplines. A controlled vocabulary can be defined as an "organized collection of words, phrases, and/or names, structured to show the relationship between the terms" (Baca 2010, 1277). The Getty Vocabularies include the *Art & Architecture Thesaurus* (*AAT*), the *Thesaurus of Geographic Names* (*TGN*), the *Union List of Artist Names* (*ULAN*), and *Categories for the Description of Works of Art* (*CDWA*). These controlled vocabularies are integral to the development of image indexing and access systems because they offer terms of description and naming that can be agreed on by all image stakeholders and users. One of the great benefits of controlled vocabularies is that they are able to provide linkages between multiple variations of a term and its synonyms, ensuring that all variants of a vocabulary term work to retrieve the same results when used as a query in a database. Controlled vocabulary terms, when compiled as a thesaurus, can be arranged hierarchically as well, allowing for objects to be narrowly cataloged, but able to be retrieved by higher-level, more general terms. This last feature is very helpful when it comes to retrieving results that are "useful groupings of images".

b) Information-Seeking Behavior of Arts Professionals

How do arts professionals search for images? To what extent are searches generally focused by subject matter rather than artist's name or title of work? How important is browsing? It is important to understand how and why users search for images before time

and money is spent on labor-intensive cataloging or crowd sourcing and tagging systems. A brief summary of studies done on the searching behavior and attitudes of arts professionals to date suggest that subject classification of images is a worthy goal for digital image libraries.

User studies in the early days of computing reveal some ambivalence among art historians with regard to new research technology. Deirdre C. Stam conducted a user study (1984) to determine the information-seeking behaviors of art historians, finding that photographic reproductions, bibliographies, indexes, monographs, and standard reference sources formed the core of art historian's research methodologies. Most of the study subjects expressed enthusiasm about future technologies; however, they exhibited less willingness to learn how to use computers and how best to manipulate the current technologies available to them.

In 1986, the Getty Art History Information Program (AHIP) along with the Institute for Research in Information and Scholarship (IRIS) at Brown University co-sponsored a user study of art historians on the topic of research and technology. The study focused on the research processes of art professionals in order to understand the areas in which automation and information systems were likely to have the greatest benefit to scholarship. The art historians interviewed for the study were in general agreement that the original object (i.e., the unique painting, sculpture, architecture, or other monument) is of primary importance in research and analysis, and that photographic surrogates serve an important but secondary role in their professional activities. Images of original art works can be a useful starting point for inquiries and comparative analysis of objects, but are viewed by art historians as potentially unreliable sources because they are always

mediated and are therefore vulnerable to subtle inaccuracies or tampering. However, art historians, generally speaking, acknowledged that their jobs would be more difficult, or at least very different, without access to good-quality photographic reproductions for teaching and research (Bakewell et al. 1988).

Jennifer Durran (1997) studied the history of art historians' use of images, concluding that the roadblocks impeding the full exploitation of digital information systems are primarily institutional and personal, rather than technical: the established patterns of the discipline led to a resistance to learning about new technologies. A preference for analogue photographs, slides, and transparencies, combined with a (valid – especially at the time of the study) perception that digital images were of inferior quality to analogue photographs, stood in the way of integrating digital images into scholarly research.

The previous studies laid the groundwork for an understanding of the importance of subject access to art images, as well as the standardization necessary to make subject indexing worth the time and the effort. However, these studies predate the important technological developments that have since made digital images ubiquitous. Digital images rapidly became easier to create, store, and find via internet searches and image databases. While by the mid-1990s, the goal was to make images available online and retrievable via database queries, the next decade would see the rise of fast internet speeds, the increasing efficiency of databases, and better search functionality for end users at the web interfaces. By the time "information overload" becomes a buzzword, images are increasingly part of the digital deluge appearing with every search engine query.

While the proliferation of art images undoubtedly made it easier than ever to find images, some scholars and users began to complain of the imprecision of searching on

the web or in non-specialist databases. In another study of art historians' attitudes toward digital image resources, Trish Rose (2002) found that one thing they hoped for was the "ability to search by more complex subject terms on the Web (e.g., art history subject with a subject in literature)" as well as more comprehensive image databases.

Another study that attempted to reckon with the problem of vocabulary in subject indexing was conducted in 1996 by Linda H. Armitage and Peter Enser. These researchers looked at a sample of queries made by arts professionals searching for images across a number of institutional web-based image collections, examining the terminology used by these subject experts to see how it differed from a professional indexer's vocabulary. They were also interested in exploring the possibility of categorizing image database queries by type. Their analysis of search terms suggested that the image queries made by the art professionals in the project sample lent themselves to categorization, and that the majority could indeed be categorized into a few types. They recommended that a generalized cataloging schema could be applied to image collections despite the fact that such collections were often idiosyncratic, local, and specialized in nature. Their research on art image queries, although restricted to a sample group of arts professionals in a controlled environment, suggests that a classification schema could be embedded in the user search interface of image databases and applied broadly.

The Museum Educational Site Licensing Project (MESL Project) was an experimental project and the first large-scale attempt to assemble a large collection of digital images and metadata from a number of participating museums in order to make those images available to users over campus networks. In the 1999 report describing the project, Howard Besser and Robert Yamashita concluded that the absence of consistently

applied metadata standards across partner institutions meant that the creation of a central, integrated database would be "problematic at best" (Besser and Yamashita 1999). The authors noted that, because "most object metadata was taken from legacy records, most vocabulary was in the language used by museum curators and registrars." Note that this project predated the widespread adoption of the Getty vocabularies among collection institutions. Besser and Yamashita suggest that "digital distribution schemes like [MESL] could be much more effective if we better understood vocabulary issues in general: how to translate the specialized vocabulary used by specialists into the vernacular used by general users, and how to better map between the various knowledge organization frameworks of different domains." The observations made by this research team reflect the historical reality that most art collections and image libraries were created to serve local needs and priorities. They were dominated by their unique institutional culture and were tailored to their particular department, institution, or interest groups. The difficulties encountered in this project are illustrative of the problem of the semantic gap issue in image indexing, which describes the difference between the vocabulary of professional indexers and experts on the one hand and nonexperts on the other. They highlight the importance of providing subject access through the addition of non-specialist terms in addition to improving and implementing metadata standards.

The Digital Picture project (www.thedigitalpicture.ac.uk), initiated in 2004, proposed to study the impact of digital images on arts education in the United Kingdom. Using survey data, the study showed that participants held a largely enthusiastic view of digital images as teaching aids. However, the survey respondents also expressed concerns about the demise of the traditional slide library and a loss of expertise in analog technologies

and traditional research methods. The study also revealed concern among arts professionals that, without ensuring metadata standards are uniformly applied, digital images might proliferate on the internet but would be unreliable and undiscoverable for scholarly use.

C. Olivia Frost et al. (2000) compared browse and search behavior in an image library using a focus group methodology. The study collected information on user approaches and assessments of different methods of searching in an image database prototype. The conclusion that Frost drew from the resulting comments provided by the participants in the study was that both browsing and text-based searching was important to professionals and non-professionals. This study offers an experimental confirmation of Shatford Layne's stress on the importance of "useful groupings" of images, showing that professionals do find value in visual browsing among images. An ideal system for the classification of images might, therefore, apply both basic and specific subject terms, capable of retrieving relevant groupings of images.

c) Social Tagging

Now that there are far fewer technological and interoperability barriers to adding subject tags and categories as index points to visual works of art, the main roadblocks are the subjective and time-consuming nature of the work. What is needed is a way to maximize expertise while reducing the resources required to provide accurate subject terms. Social tagging has been suggested as a way to complement the descriptive cataloging of images through crowdsourcing, which can add any number of terms to

individual images. Social tagging is a strategy in which members of the public are recruited to view images and to apply descriptive terms, or "tags," to those images directly through the web interface. Many nonprofessionals will be familiar with tagging from popular social media sites like *Flickr* or *Pinterest*, where users could upload images and tag them with their own descriptive terms. Social tagging harnesses the expertise of volunteers to add descriptive tags and to augment the image metadata to include non-specialist descriptive and subject terms and thus to improve subject access to images. In the case of art images, there is an extensive and somewhat arcane set of vocabulary terms that has become entrenched in the language used in museums and by art professionals, and which informs the professional controlled vocabularies. While there is great deal of clarity achieved by these classification systems, a nonexpert user might navigate them with difficulty.

One of the benefits of social tagging of art images is the inclusion in the image metadata of non-specialist terms. Typically, the metadata for images that originate in museum or art-historical collections is written by and for museum staff and other arts professionals. Social tagging creates a user-generated set of descriptive terms, or a "folksonomy," and can be viewed as a way of democratizing metadata. Folksonomies have been defined as "a form of manual, ascriptive, natural language, democratic indexing, which is typically undertaken by resource creators and resource users who have low levels of indexing expertise, high levels of domain knowledge, and widely varying motivations" (Furner 2010, 1858).

The enthusiasm for social tagging of images was in evidence at the 2005 conference meeting of Museums and the Web, where the potential benefits of social tagging was

debated during a "Cataloguing by Crowd" professional forum. A substantial benefit of tagging, they argued, was the potential to reach new audiences and increase audience engagement and sense of ownership by encouraging users to interact in meaningful ways with the collections in the act of tagging and contributing information and public expertise to museum collections. This second benefit – that of creating a sense that museum audiences are welcomed into the rarified museum world as active contributors of knowledge – is a significant part of the appeal of social tagging projects for museums and undoubtedly represents a significant societal shift with regard to the role that cultural institutions play in our lives.

There have been a few studies of the impact and value of social tagging of image collections since 2005. In her study of user-centered indexing in digital image collections, Krystyna K. Matusiak compared images and tags from Flickr with images and metadata from a university collection titled "Cities around the World," which uses professional indexing standards and data schema. Looking at the relative strengths and weaknesses of Flickr-style tagging versus traditional indexing, she points out that one of the main differences is that social tagging (at least as of 2005) was mainly flat and non-hierarchical. As Matusiak points out in the context of Flickr, non-hierarchical indexing places "Europe" on the same level as "Rome," for example, which can lead to confusion. And tags were not sorted into conceptual categories, so proper names of people existed at the same level and in the same categories as visual descriptors. There was also the problem of misspellings, singular versus plural spellings, homonyms, and irrelevant tags. One way to maximize the benefits of social tagging, it is suggested, might be to create faceted tagging systems. Faceted tagging can help provide semantic structure to user-

contributed tags, and can therefore make tagging systems more appealing to curator and museum staff (Chae 2011). Matusiak argued that the benefits of social classification are greatest when used in addition to traditional indexing, which provides structured data and disambiguation capabilities. However, the many flaws of social tagging with regard to ambiguity and lack of organization are outweighed by its ability to provide a better match to users' own vocabularies. In addition, Matusiak points out, social tagging can be used to foster a greater sense of user engagement with a collection, and even to build virtual communities (2006, 293-6).

Echoing the general enthusiasm toward social tagging, Stvilia, Jorgensen, and Wu (2012) conducted a controlled end-user study of social metadata examining the potential value of such a system. The study, which measured user-contributed tags against existing indexing terms from the Thesaurus of Graphic Materials (TGM) and the Library of Congress Subject Headings (LCSH), found that social metadata added a significant degree of "coverage", or access points, to the existing professional vocabularies. The study also found that users found the additional social metadata to be generally useful. However, participants also valued the index terms from the existing controlled vocabularies (TGM and LCSH) more that the social metadata. The conclusion of this study confirms other findings about social tagging in suggesting that it has great potential as a supplement to professional indexing, but that professional classification and reference to controlled vocabularies when choosing subject index terms is still an essential component of image metadata.

III. Experimental Tagging Projects

Successful implementation of social tagging systems for art image collections is dependent upon an understanding of how users tag works of art, the terminology they use, and how the resulting terms relate to the existing documentation for art images maintained by museums and other collections. Building on the studies discussed in the previous section, some researchers have formed collaborative initiatives with museums to construct experimental social tagging systems. These pioneering projects were created in order to examine the capabilities of social tagging, its usefulness to the institutions, and its challenges or limitations. Three experimental tagging programs – Steve.museum, the Brooklyn Museum Posse, and ArtUK's Your Paintings Tagger – are reviewed here as useful case studies addressing the benefits and the downfalls of social tagging and making recommendations for the implementation of future social tagging systems.

a) Steve: The Museum Social Tagging Project (Steve.museum)

The Steve.museum was a public tagging project initiated by Jennifer Trant and David Bearman of the group Archives & Museum Informatics, in collaboration with a number of art museums. The project was designed as a way to examine key questions about the feasibility and usefulness of public tagging functionality in image databases,

primarily those accessible via museum websites. The primary research question guiding

the project was "can social tagging and folksonomy improve online access to art museum

collections" (Trant 2009, 9). In the course of the project, an experimental tagging system

was built and made operational for public tagging from 2006 to 2008, using object

images and metadata from the collections of the partner museums. Visitors to the project

tagger were asked to enter descriptive tags for images on the website. Taggers were not

presented with faceted tagging or any other means of guiding them toward a structured

vocabulary or taxonomy of descriptive categories.

In her analysis of the project and the resulting data, Jennifer Trant suggests that

tagging could provide another layer of access, augmenting museum documentation and

access points provided by indexers but not replacing it. One question prompted by social

tagging is whether it does significantly improve access. Trant found that 86% of user-

contributed tags were not found in museum documentation, which represents a significant

difference between the two vocabularies (Trant 2009, 37). If the resulting folksonomy, or

user-contributed vocabulary, really does contain a significant number of terms that differ

from the existing metadata, then social tagging does, in fact, provide additional access

points and can potentially improve search results for users of online image databases. Part

of the reason for this divergence between user-contributed and professional vocabularies

in the case of the Steve.museum project was that the museum metadata, against which the

user tags were compared, in most cases contained only basic label text. Label text, as

discussed above, is generally limited to five fields: artist, date, title, material, and

dimensions. (Thus, the data show the curious result that the most frequently submitted

user tag, "woman", was not found in the museum documentation.) This limited metadata,

which does not generally contain subject terms, reflected the extent of the access points that users had for works of art on most museum websites at the time of the study. However, for the purpose of understanding how the user tags might fare against more thoroughly indexed images, the investigators expanded the dataset of museum documentation with additional documentation from the curatorial files. This expanded documentation included narrative texts, such as interpretive materials and scholarly essays. When the user tags were compared to this extended documentation, however, the two vocabularies did not match significantly better. While this documentation consisted of unsystematic data, including narrative texts that might contain terms only to negate them (i.e., describing a painting as "showing affinities with impressionism"), the findings still suggest that user-contributed tags do, in fact, create new access points. The Steve.museum project team also compared the project tags to the terms found in two controlled vocabularies, the Art and Architecture Thesaurus (AAT), which is one of the controlled vocabularies an indexing professional would use when applying subject metadata to image objects documentation in museums where subject indexing is supported. After controlling for ambiguous terms and truncation ambiguity and errors, they found the number of actual exact matches between user tags and Getty controlled vocabulary terms turned out to be quite small at around fifteen percent. This result suggests that the taggers participating in the Steve.museum project were, in fact, contributing a new vocabulary of descriptive terms through their tagging activity. The Steve.museum system was successful in generating a folksonomy that differed significantly from both existing museum metadata as well as the more comprehensive professional subject thesaurus.

The next question that the study addressed was whether the tags can be considered "useful" additions to image metadata by professional museum staff. The project team asked museum staff members to assess a sample of user tags for their usefulness as access points, finding that the majority of terms (88%) were considered useful. Additionally, of the terms that had been suggested more than once, by different users for the same image, 97% were deemed useful. The margin between terms used once and terms used more than once is not a huge difference, but significant, and lends support for tagging systems in which tags are only applied to the object when they have been suggested more than once. A comparison of different tagging environments in the study also illustrated that when tags assigned by previous users were visible to the tagger, they added more new tags but a smaller number of tags in total than when they did not see the other users' tags (Trant 2009).

The researchers also considered whether user tags corresponded to the terms used by audiences to search art museum collection websites. If tags and search terms (i.e., terms that visitors to museum websites are using, regardless of whether those searches are successful) match, then tagging would theoretically improve searching. However, this question is problematic to answer. The researchers found little overlap between tags and search terms used in the museum websites. Trant suggests that online searching is a learned behavior – that people search on terms that they already know achieve result in museum searches, such as artists' names – and that therefore the types of terms that people now frequently search on, and the types of terms that occur to users viewing images in an experimental tagging project, are different. Perhaps the terms used by taggers in an experimental environment are more idiosyncratic, even playful, because

there is little precedent for tagging activity outside of websites with a social-media component, like Flickr or Pinterest. With minimal guidelines or education about metadata or how access points work, taggers are free to be creative and playful in their choice of descriptive terms.

In addition to the extensive analysis of tags undertaken by the Steve.museum research group, the tags were made available for other researchers to analyze for their own studies. The steve.museum tags formed a primary dataset for a computational linguistic study of social tagging, conducted by Judith L. Klavans and others (Klavans et al. 2011). This study showed that the majority of tags applied to images in the project described people and objects, and that the bias in social tagging toward these types of attributes of an image can help account for the differences between social and professional vocabularies when it comes to tagging digital art images. Klavans found that users tended not to use higher-level content terms (i.e., Panofsky's iconography or iconology) in their tagging. This finding is inline with the results of a previous user-study on the searching habits of art historians, which found that *about*-ness was a determinant of relevance for about 20% of image database queries, while *of*-ness was relevant for 30% (Layne Shatford 1998). These results suggest that it is marginally more important to have accurate and thorough indexing of the identifiable objects depicted in an image, and less important to provide access points to the symbolic or conceptual content of images.

b) The Brooklyn Museum Posse

The Brooklyn Museum has undertaken several innovative approaches to encouraging greater user engagement with their collections, including experiments with social tagging. The Brooklyn Museum initiated its social tagging experiment, the Brooklyn Museum Posse, in 2008, to coincide with the launching of their online image-viewing tool. The Museum created an online "community" of users with registered profiles who were encouraged to contribute tags for objects in the collection through two tagging games. The first tagging game, formerly available on the Brooklyn Museum website (www.brooklynmuseum.org) was called *Tag! You're It*. However, perhaps because of playfulness encouraged by the game aspect, it soon became clear to the investigators that many irrelevant tags were being contributed. In order to address this problem, museum staff created a second project, called *Freeze Tag*, which added a crowd-sourced quality control feature. In order for tags to be applied to the object, they would have to be suggested or agreed upon by three or more users. These tags would then be visible in the online interface for other users who would be able to delete existing tags, as long as three or more registered users were in agreement about the deletion.

The Posse project was retired in 2014, with the conclusion that the tagging project just wasn't meeting the "democratization" ideals that the project staff had envisioned. One of the main ideals of social tagging was to introduce non-specialist descriptive terms into the metadata for collection images. The addition of "everyday" terminology should, in theory, make object more discoverable to non-specialists without extensive knowledge of artists' names, periodization terms, or other specialist knowledge and terminology. However, at the Brooklyn Museum, in contrast to the Steve.museum project, a large portion of the tags came from the Museum's own staff, and most of the rest from other

museum professionals and art history students (Bernstein 2014). And as both the Brooklyn museum posse and steve.museum make clear, taggers tend to submit general tags, pointing out easily identifiable objects depicted. However, when they studied the terms that users entered into the search field on the Brooklyn Museum website when looking for images, they found that the majority of search terms for the collection were specific. Visitors to the website typically searched by artist names, art movements, and cultures, which incidentally are categories that museum-goers might be quite familiar with from the label text they have viewed alongside art objects. Fewer searchers were interested in basic content descriptions or general higher-level thematic categories. These results suggested that social tagging, at least in the form of the two Posse experiments, might not be especially useful to users of the Brooklyn Museum website (Bernstein 2014).

The observations and conclusions drawn by the Brooklyn Museum staff as a result of six years of the Posse project is not necessarily extendable to all art museum social tagging projects or to all art museums. It is possible that specific local crowds will find social tagging more or less useful at different institutions. However, the Brooklyn Museum's decision to refocus their energies and technical staff resources away from tagging projects and toward other audience engagement initiatives suggests that social tagging and crowd sourcing technologies would have to be improved before they can be counted on as solutions to metadata and discoverability challenges in digital image collections.

c) Art UK – Your Paintings Tagger

The Your Paintings Tagger project, in contrast to the Brooklyn Museum Posse, was relatively successful in harnessing social tagging via a game-like interface to increase subject access to art works. The "Tagger" project (https://artuk.org/participate/tag-artworks) was launched in 2011 as part of a project called Your Paintings, which aimed to create a searchable, public-access database of all of the paintings held in the United Kingdom. The project started with paintings, relying on crowd-sourced information to document nearly all of the oil paintings, in both public and private collections, held in the UK. These paintings were represented in the Your Paintings database with high-quality images and basic metadata, which was expanded through the addition of user-contributed keyword tags. Since completing their compendium of UK paintings, the project has been renamed Art UK and reconfigured to gather information about prints, drawings, and watercolors from across that geographic entity. They are currently preparing to compile a database of images of UK sculpture as well.

The metadata challenges in the Your Paintings project were indicative of any inter-institutional image collection where objects and their metadata are sourced from disparate museums and other repositories (and even private owners, in this case), which may have only minimal and sometimes unverified information about the artworks in their collections. The coordinators of the project had to rely on the limited information they received from the participating institutions. The metadata fields were restricted to the descriptive fields artist, title, medium, size, production date, acquisition method, and an assigned identity number (Eccles and Greg 2015). The Tagger project was designed as a means to crowd source metadata in order to supplement that minimal information and to

verify it where possible. The interface for the Tagger project was designed to be user-friendly and to elicit useful tags. The program leaders looked to other projects, including steve.museum, to guide their project, and were inspired by an astronomy social tagging project, *Galaxy Zoo*. They worked with Galaxy Zoo staff when designing the Tagger. In the interest of generating the most useful tags for the collection, the Paintings Tagger, like the astronomy project, offered users a brief tutorial at the beginning of tagging. The Tagger guides the user by separating the tagging steps by type: there are separate steps for Things, for People, Places and Events, and for Subjects. For the subject field, the project team developed a structured, hierarchical set of subject keywords to help clarify and systematize this key attribute. While the objects depicted in an image are often easily identifiable, the art-historical subject of a painting, in the sense of its narrative, cultural, or symbolic "meaning" (i.e. Panofsky's iconography and iconology), may be lost to memory, unintelligible to a modern audience, or too subjective to find ready agreement. To address these problems, the team created two- or three-tier hierarchies of subject keywords that could describe many subjects or themes of the artworks." Categories for the Description of Works of Art (CDWA) and the Union List of Artist Names (ULAN) were used to supply suggested terms for the descriptive fields. Finally, terms entered in the "things" category were checked against the Oxford English Dictionary for accuracy and the spelling alternatives suggested to the user. Only those tags that were agreed on by four users would be permanently attached to the object record. In the end, they found that quality tags were produced which made observable improvements to the ability for other users to access the images. However, this level of quality control also has the effect of slowing down the project. The tagging of the Art UK collection proceeded slowly and it

would take a long time for all of the images in the collection to be considered

"completed", or fully tagged, which the project defined as tagged by 15 different users.

The project however, has improved access to the artworks represented in the Art UK

database via the website. For instance, groupings of images were created based on

thematic tags contributed by users and are now available on the Art UK website, where

users are able to browse though these virtual thematic collections of art works.

IV. Conclusion

Johanna Drucker recently (2013) surveyed the state of digital humanities, and predicted that as the body of art historical monuments is increasingly digitized and made available online, there will be new questions and answers made possible by "big data" and other technology-driven research methods. But first, researchers will need to be able to access images according to more categories than are historically available as label text. In our era of big data, it is not enough to make individual images discoverable. It has become relatively easy for a knowledgeable researcher to locate an image of a known painting, for example. The challenge is to find *new* ways of grouping images, and innovative ways of discovering new or under-researched images. This is why subject and content searching is valuable. Art history can develop in tandem with the technology as new methods of access help to shape the kinds of questions professionals and scholars are encouraged to ask. Experimental projects in social tagging, like Steve.museum, Art UK's Tagger, and the Brooklyn Museum Posse, have shown that crowd sourcing subject tags for art images can, with the right design, provide real value to institutions in the form of greater access points and deeper audience engagement.

If, as Sarah Shatford Layne argued, subject indexing should be able to provide (1) access to individual images, and (2) useful *groupings* of images, then these two goals of image retrieval are best accomplished if repositories are able to apply subject terms to

image metadata in a clear and organized way. A faceted, hierarchical approach to subject cataloguing ideally ensures the greatest precision when it comes to retrieval of images both individually and as related groups. The creation of tags by volunteer users, with the right interface and guidance, has proven to be a successful approach to enhancing existing metadata in order to make images discoverable in new ways. Thorough subject indexing through well-designed social tagging systems has the potential to facilitate new and original areas of research in the humanities.

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