Theodore Calvin Pease Award

User Understanding of Metadata in Digital Image Collections: Or, What Exactly Do You Mean by "Coverage"?

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Abstract

This study looks at the usefulness of Dublin Core metadata in digitized image collections from the user's perspective. Are there elements that users don't find useful? Do users feel useful information is missing? Are labels and elements provided for users arranged in a way that makes sense to them? This paper uses a survey, focus groups, and search/usability testing to gain insight into the kinds of information nonexpert users rely on when searching for images and to identify the vocabulary that best expresses that information.

Introduction

Online searching is integral to accessing archival materials, both through online finding aids and, more significantly, within collections of digitized objects. Improvements in OCR and other technologies make it possible to provide full-text access to digital collections, and much research has studied

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searching in textual documents. Image searching, however, remains a challenge. The technology for searching the content of images remains limited, and, as a result, image collections continue to rely on textual metadata for access.[1] Because of this dependence on metadata, image collections must provide metadata that not only works well for archivists, their workflows, and the technology they use, but is also understandable and useful to users. This study explores the metadata elements nonexpert users find useful in searching for and selecting images from a large collection of digitized images. Are users able to interpret the metadata elements that are presented to them correctly, and do those elements provide information that users perceive to be useful? This study also aims to learn if users find some elements not useful, either because they do not need the information or because the labels are confusing, and if users think useful information is missing. In the context of this study, *metadata* is information that allows users to look at a list of search results and decide which images warrant further exploration, which are most relevant to their search, and which are most appropriate for their task. Nonexpert users were selected as the focus of this research because little exploration has been done of what searchers with less experience or expertise find appropriate and meaningful. Most research centers instead on information experts such as librarians and archivists or on domain experts, two groups that are assumed to be better at finding and selecting information than nonexperts.

To control for the type of description, this study focuses on Dublin Core (DC) metadata for three reasons. First, Dublin Core is a "bare minimum" standard; it has only fifteen elements and is designed to be simple and easy to use. Its simplicity makes it attractive to both librarians and archivists as cultural heritage institutions move toward the "more product, less process" approach.[2] Second, a lighter metadata schema is cheaper to implement, and Dublin Core is especially attractive because of the number of systems that support it natively. A wide variety of commercial systems adopted and support it, including CONTENTdm and Greenstone, two popular off-the-shelf digital content management systems. Finally, Dublin Core is OAI-PMH compliant, another factor that makes it attractive for use in libraries and archives.[3] This study analyzes whether a schema that is simple and useful for librarians and archivists also allows for meaningful access by nonexpert users.

[1] Michael S. Lew, Nicu Sebe, and John Eakins, "Challenges of Image and Video Retrieval," paper presented at the International Conference on Video Retrieval, London, U.K., 18–19 July 2002, 1–6, at http://portal.acm.org/citation.cfm?id=753218, accessed 7 November 2009.

[2] Mark A. Greene and Dennis Meissner, "More Product, Less Process: Revamping Traditional Archival Processing," *American Archivist* 68, no. 2 (2005): 208.

[3] See, for example, NC ECHO, at http://www.ncecho.org/dig/index.shtml, accessed 7 November 2009.

Table 1. Dublin Core Elements and Their Definitions

Element Name	Definition
Contributor	An entity responsible for making contributions to the resource.
Coverage	The spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant.
Creator	An entity primarily responsible for making the resource.
Date	A point or period of time associated with an event in the life cycle of the resource.
Description	An account of the resource.
Format	The file format, physical medium, or dimensions of the resource.
Identifier	An unambiguous reference to the resource within a given context.
Language	A language of the resource.
Publisher	An entity responsible for making the resource available.
Relation	A related resource.
Rights	Information about rights held in and over the resource.
Source	A related resource from which the described resource is derived.
Subject	The topic of the resource.
Title	A name given to the resource.
Type	The nature or genre of the resource.

Dublin Core elements and their definitions are drawn from the Dublin Core Metadata Initiative Metadata Terms: http://dublincore.org/documents/dcmi-terms/#elements.

Literature Review

While text searching is well developed, image searching continues to be challenging. Several papers over the last ten years have addressed technical challenges in image searching, including color-texture classification, face detection, and object recognition, but the "semantic gap" identified by Michael Lew et al. remains a significant barrier.[4] The idea of the semantic gap identifies the split between low-level features, such as color, texture, and shape, that are easily quantifiable and detectable by computers, and high-level features, such as people, objects, events, and settings. High-level characteristics, which contribute to what could be called the *meaning* of the image, are not typically automatically detectable.[5] Simple content-based searching is based on low-level characteristics: finding exact matches to keywords in a text, for example, or finding images based on the dominant color. Robust content-based searching requires bridging the semantic gap. To return meaningful results, the retrieval system must accept a user's query, identifying both low-level characteristics and higher-level characteristics inherent in the query.[6]

Concept-based indexing, by contrast, is based on textual metadata, created manually, that represents image content. This is the "traditional" method of

[4] Lew et al., "Challenges of Image and Video Retrieval."

[5] Meng Yang, Barbara Wildemuth, and Gary Marchionini, "The Relative Effectiveness of Concept-Based Versus Content-Based Video Retrieval," paper presented at the 12th annual ACM International Conference on Multimedia, New York, 10–15 October 2004, 368–71, at http://portal.acm.org/citation.cfm?id=1027613, accessed 7 November 2009.

[6] Lew et al., "Challenges of Image and Video Retrieval."

cataloging and indexing images: catalogers interpret image content, identify important characteristics, and encode semantic information in metadata that can be indexed automatically. For example, Meng Yang et al. looked at user performance in content- and concept-based video retrieval systems.[7] They found that, for specific queries, *Einstein*, for example, concept-based searching performed well; for generic queries, like *scientist*, a hybrid system that combined concept- and content-based aspects proved most useful. Their research suggests that for images, unlike text, content-based searching may not be the best option. Instead, textual metadata accompanying an image might be more useful.

Human-generated metadata, however, is expensive and time consuming to create. Images often do not have extensive pre-existing metadata, and so, metadata must be generated at the time of digitization or ingest of digitally born images. While some metadata can be generated automatically, descriptive metadata remains a challenge to create efficiently. Approaches to streamlining metadata creation include training paraprofessional staff and students to replace catalogers,[8] creating simplified controlled vocabularies to aid in rapid cataloging,[9] and calling upon authors and other domain experts to contribute metadata.[10] Some libraries and archives have developed guidelines for creating limited metadata for which some elements are required and others are recommended or optional.[11] As archives adopt the "more product, less process" approach, it is increasingly important to streamline and simplify cataloging and processing workflows.[12] Metadata creation can be a significant barrier to reducing processing overhead.

In his 1970 collection of essays, *Meaning in the Visual Arts*, Erwin Panofsky identifies three intersecting and complementary sources of meaning in images: "materialized form, idea (that is, in the plastic arts, subject matter), and content."[13]

[7] Yang et al., "Concept-Based vs. Content-Based Video Retrieval."

[8] Jane Greenberg, Maria Cristina Pattuelli, Bijan Parsia, and W. Davenport Robertson, "Author-generated Dublin Core Metadata for Web Resources: A Baseline Study in an Organization," paper presented at the International Conference on Dublin Core and Metadata Applications 2001, Tokyo, Japan, 22–26October 2001, at http://www.nii.ac.jp/dc2001/proceedings/product/paper-06.pdf, accessed 7 November 2009.

[9] See, for example, the Library of Congress's FAST project at http://www.oclc.org/research/activities/fast/default.htm, accessed 14 November 2009.

[10] Amanda Wilson, "Toward Releasing the Metadata Bottleneck—A Baseline Evaluation of Contributor-supplied Metadata," *Library Resources and Technical Services* 51 no. 1 (2007): 16.

[11] For examples, see the Claremont Colleges Digital Library at http://ccdl.libraries.claremont.edu/inside/CCDLmetadata.pdf; the Washington Research Libraries Consortium at http://www.wrlc.org/resource/colldev/poldcguide.shtml; and NC Echo at http://www.ncecho.org/dig/ncdc2007.shtml, all accessed 7 November 2009.

[12] Greene and Meissner, "More Product, Less Process."

[13] Erwin Panofsky, *Meaning in the Visual Arts: Papers In and On Art History* (Garden City, N.Y.: Doubleday & Co., 1955), 16.

Metadata can address any of these levels of meaning, and different schemas attempt to encode one or more. Dublin Core, the subject of this study, captures descriptive information at a very low level; only the simplest and most literal elements of the content, idea, and form can be contained in the Dublin Core fields. This raises the question of how, exactly, "good" metadata should be defined.

Most evaluative work regarding metadata has focused on its correctness, appropriateness, and accuracy;[14] far fewer researchers have examined its usefulness in the context of a collection's designated community. In 2004, Chiara Francalanci and Barbara Pernici presented a model for assessing data in relation to user expectation.[15] Their work, although geared toward data quality analysis rather than metadata, is a step toward quantitative evaluation and standardized methodology for assessing user perceptions of data.

When users have been studied, findings typically address the discoverability and navigation structure of collections rather than item-level information.[16] Interface evaluation has a long history, dating back to the first computerized bibliographic systems of the 1980s,[17] and studies of bibliographic displays have employed a wide range of user-centered evaluation methods, particularly surveys and focus groups.[18] These studies emphasize information architecture issues, such as screen layout, because most of the systems studied are primarily access systems—for example, collections of finding aids—not collections of digital resources. In these cases, the user's goal is to find information *about* a physical artifact rather than to *access and use* an electronic document in an online environment.

Some attention, however, has been paid to the problem of evaluating metadata schema and specific elements in relation to users. Wendy Duff and Penka Stoyanova raise the issue of users' understanding and interpretation of the meaning of element labels in descriptive systems, determining that the terminology used in finding aids could be confusing to users (especially the term *fonds*, as well as information about physical description and dates of creation).[19] In

[14] For example, see Naomi Dushay and Diane I. Hillman, "Analyzing Metadata for Effective Use and Re-use," paper presented at DC-2003: 2003 Dublin Core Conference, Seattle, Washington, 28 September–2 October 2003, 1–10, at http://dc2003.ischool.washington.edu/Archive-03/03dushay.pdf, accessed 7 November 2009.

[15] Chiara Francalanci and Barbara Pernici, "Data Quality Assessment from the User's Perspective," paper presented at the 2004 International Workshop on Information Quality in Information Systems, Paris, France, 18 June 2004, 68–73, at http://portal.acm.org/citation.cfm?id=1012465, accessed 7 November 2009.

[16] Elsa Kramer, "IUPUI Image Collection: A Usability Survey," *OCLC Systems and Services* 21, no. 4 (2005): 346–59, doi: 10.1108/10650750510631712.

[17] Walt Crawford, Lennie Stovel, and Kathleen Bales, *Bibliographic Displays in the Online Catalog* (White Plains, N.Y.: Knowledge Industry Publications, 1986).

[18] Wendy Duff and Penka Stoyanova, "Transforming the Crazy Quilt: Archival Displays from a Users' Point of View," *Archivaria* 45 (1998): 44.

[19] Duff and Stoyanova, "Transforming the Crazy Quilt."

2001, Minnesota's Foundations Project conducted extensive usability testing of its interface and system, including Dublin Core metadata added to the documents in the collection. The results indicated that the inclusion of Dublin Core metadata helped users to search for documents more effectively, but the study did not look at users' interaction with metadata after the initial search was conducted.[20] The Cornell University MetaTest project aims, among other things, to empirically determine the significance of metadata and its utility in providing access to information.[21] The MetaTest study relies on experiments that utilize eye-tracking to reveal frequently used metadata elements and users' reliance on metadata and other contextual clues in finding relevant resources. This study is ongoing.

In June 2008, Ying Zhang and Yuelin Li published a user study of two metadata schemas for moving image collections.[22] They asked thirty librarians, archivists, educators, and members of the general public to complete four tasks and, from their responses, evaluated how users perceived usefulness of the metadata fields provided. They found significant differences among metadata fields in usefulness to users working within a moving image collection.

In addition to examining what metadata elements users find useful and understandable, another area of concern is how well metadata elements line up with the search terms users employ. Youngok Choi and Edie Rasmussen's 2003 study explored user queries submitted to the Library of Congress's *American Memory* photo archives.[23] They found that most users describe their targeted image content in "terms of kind of person, thing, event, or condition depending on location or time." In particular, subject search terms and format terms were popular among the historians who participated in the study. Similarly, Corinne

[20] Foundations Project, "Foundations Project Usability Testing: Dublin Core Metadata and Controlled Vocabulary Study," at http://www.bridges.state.mn.us/user2study.pdf, accessed 7 November 2009, and Eileen Quam, "Informing and Evaluating A Metadata Initiative: Usability and Metadata Studies in Minnesota's Foundations Project," *Government Information Quarterly* 18, no. 3 (2001): 181–94, doi: 10.1016/S0740-624X(01)00075-2.

[21] Elizabeth Liddy, Eileen E. Allen, Christina M. Finneran, et al., "MetaTest: Evaluation of Metadata from Generation to Use," paper presented at 2003 Joint Conference on Digital Libraries, Houston, Texas, 27–31 May 2003, 398, at http://doi.ieeecomputersociety.org/10.1109/JCDL.2003.1204917, accessed 7 November 2009, and Elizabeth Liddy, Eileen Allen, Sarah Harwell, et al., "Automatic Metadata Generation and Evaluation," paper presented at the 25th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, Tampere, Finland, 11–15 August 2002, 401–2, at http://portal.acm.org/citation.cfm?id=564464, accessed 7 November 2009.

[22] Ying Zhang and Yuelin Li, "A User-Centered Functional Metadata Evaluation of Moving Image Collections," *Journal of the American Society for Information Science and Technology* 59, no. 8 (2008): 1331–46, doi: 10.1002/asi.20839.

[23] Youngok Choi and Edie Rasmussen, "Searching for Images: The Analysis of Users' Queries for Image Retrieval in American History," *Journal of the American Society for Information Science and Technology* 54, no. 6 (2003): 498–511, doi: 10.1002/asi.10237.

Jorgenson and Peter Jorgenson found that user queries tend to be "descriptive and thematic" rather than focusing on unique terms such as personal names.[24]

Choi and Rasmussen's study focused on historians; similarly, many other studies looked at subjects with advanced training in a particular domain or in information seeking: librarians, archivists, and educators;[25] image professionals,[26] and library and information science students.[27] Many image collections, though, have a broad spectrum of users, from expert researchers to undergraduates to the general public; it has not been established whether conclusions that are drawn from data about experts can be applied to nonexperts.

Defining metadata is an unsettled problem, and image metadata even more so. Studies have explored the possibilities of content-based searching for images, but the technology remains undeveloped. Human-generated contextual and content-centered metadata have been shown to be valuable but expensive and labor-intensive to generate. In an effort to reduce the burden of generating metadata, several research projects center on the evaluation of metadata elements and defining the needs of users with respect to the kind of information they need. Many of these studies, though, used expert populations as their subject base. This study builds upon the foundation laid out in these papers; it evaluates both a schema and a population not studied before.

Methodology

This study addresses three different aspects of metadata usefulness:

1) User-generated expressions of information they think is useful,
2) User understanding and perceptions of the usefulness of Dublin Core elements, and
3) User response to Dublin Core elements within the context of a real-world digital image collection.

The methodology triangulates data from three distinct sources. First, a survey gathered information about metadata users expressed in their own words. Second, information collected through two focus groups built upon those data, adding detail and depth concerning users' rationales behind what they say they want, as well as their interpretation and understanding of Dublin Core elements. Finally, a searching test addressed the question of whether users behave in a manner that aligns with their ideas about what information is useful to them.

[24] Corinne Jorgensen and Peter Jorgensen, "Image Querying by Image Professionals," *Journal of the American Society for Information Science and Technology* 56, no. 12 (2005): 1241–360, doi: 10.1002/asi.20229.

[25] Zhang and Li, "User-Centered Functional Metadata Evaluation."

[26] Jorgensen and Jorgensen, "Image Querying."

[27] Choi et al., "Searching for Images."

Study Population

The sample population for this study was undergraduate students. Undergraduate students are by far the biggest demographic group within a university setting. Although professors and graduate students might be heavier on-site users of archives, undergraduates broadly use digital collections. As a group, undergraduates have limited expertise in searching and information retrieval.[28] Thus, it is critical for this audience that the metadata available in digital collections is appropriate and meaningful.

Undergraduates were recruited in different ways for each of the three parts of the study. Survey participants were recruited in person at an undergraduate library at a large state university. Focus group and usability participants were recruited by announcement in an undergraduate course in informatics and through an online recruiting system frequently used for psychology and economics studies. All undergraduates were eligible to participate in all portions of the study, but they could not participate in more than one part of the study. In the usability and focus group portions, volunteers were screened based on academic major to avoid skewing too heavily toward one area of study.

In total, 78 individuals participated in the study (50 survey subjects; 18 focus group participants; and 10 in the searching tests), ranging from first-year undergraduates to first-year graduate students.[29] All subjects completed the same demographic questionnaire, which can be found in Appendix A.

As seen in Figure 1, half the participants (50%) across the entire study were upper-division students and slightly less than half (33 participants, or 42.3%) were lower-division students. The remainder (6 individuals, or 7.7%) were graduate or professional students. They reported 40 different majors, plus 7 participants who were undecided at the time of the study. I grouped related majors into 4 major groups of study, as seen in Figure 2. The *n* for this figure is larger than the number of individual participants because 16 students reported double majors.

The questionnaire inquired about participants' experience using online library catalogs, if they had used archives, how frequently they use search engines and image searches, and their search expertise. As seen in Figures 3, 4, and 5, overall, participants were very familiar with searching for text and images online through commercial search engines. 97.4% reported using Google or another

[28] For a review of assessments of undergraduate information literacy, see Patricia Davitt Maughan, "Assessing Information Literacy Among Undergraduates: A Discussion of the Literature and the University of California-Berkeley Assessment Experience," *College and Research Libraries* 62, no. 1 (2001): 71.

[29] Six first-year graduate students participated in the survey portion of the study. Because recruitment was carried out in the undergraduate library, participants were not initially screened based on grade level. All first-year graduate students who participated were pharmacy students in a combined, five-year undergraduate master's program. Their answers were not significantly different from those of the undergraduate population, so that data was included in the analysis.

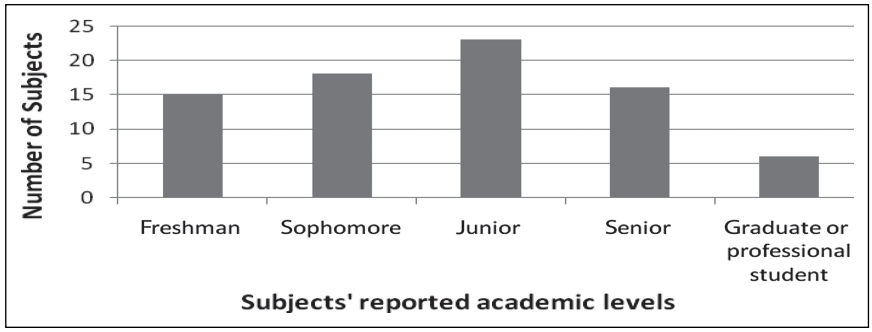

FIGURE 1. Academic levels (n=78).

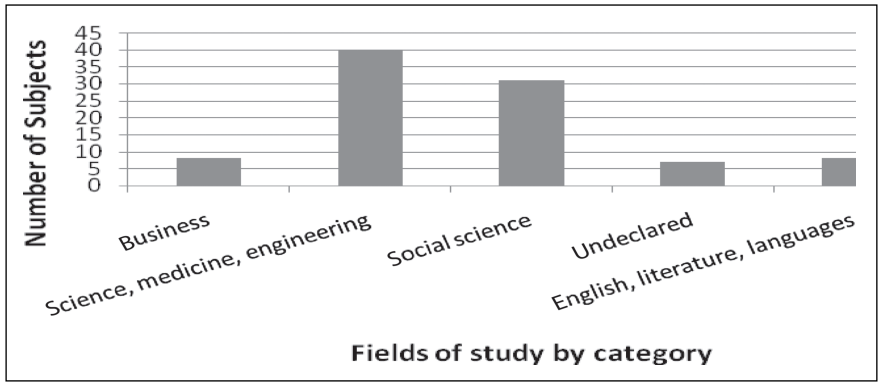

FIGURE 2. Fields of study (n=94).

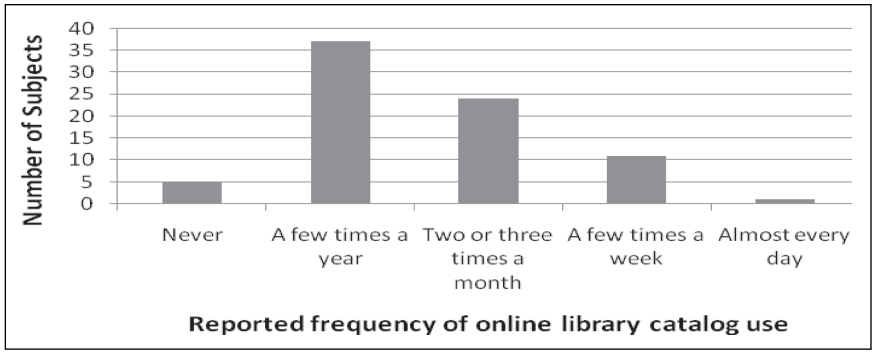

FIGURE 3. Library catalog usage (n=78).

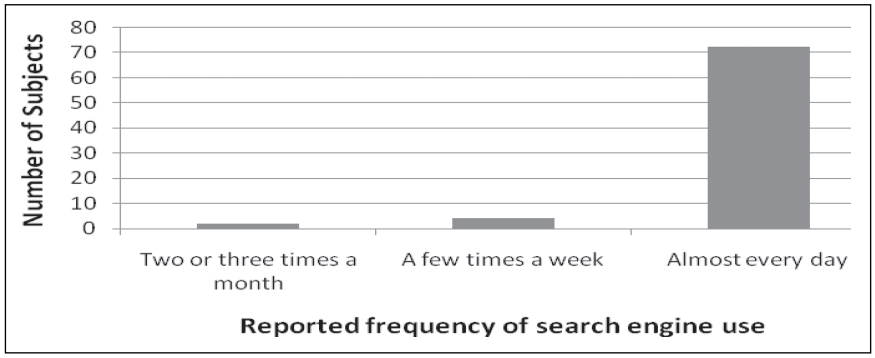

FIGURE 4. **Search engine usage (*n*=78).**

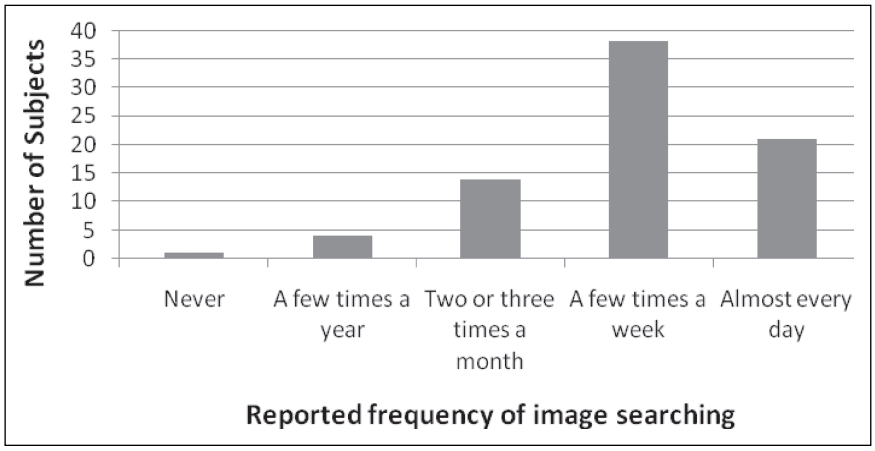

FIGURE 5. **Image searching (*n*=78).**

search engine almost every day or a few times a week, and 75.6% reported searching online for images with the same frequency. By comparison, only 15.3% reported using an online library catalog more than two or three times a month.

Despite their familiarity with searching online for both text and images, participants acknowledged some difficulty in finding what they look for. Just 6 participants (7.7%) indicated that it was never hard to find what they looked for online (see Figure 6). The greatest proportion expressed a relatively high comfort level with searching online: 41.0% said it was rarely difficult to find what they are looking for online. About half of the students (51.2%) said it was sometimes or occasionally difficult.

As seen in Figure 7, half the participants indicated that they had experience using archives; this is an unexpected result. Subjects filling out the questionnaire as part of the usability testing and focus groups (38 participants, or 36% of

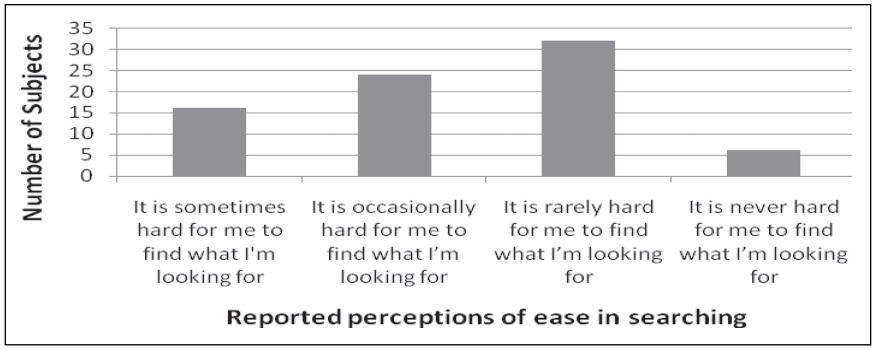

FIGURE 6. **Search expertise (*n*=78).**

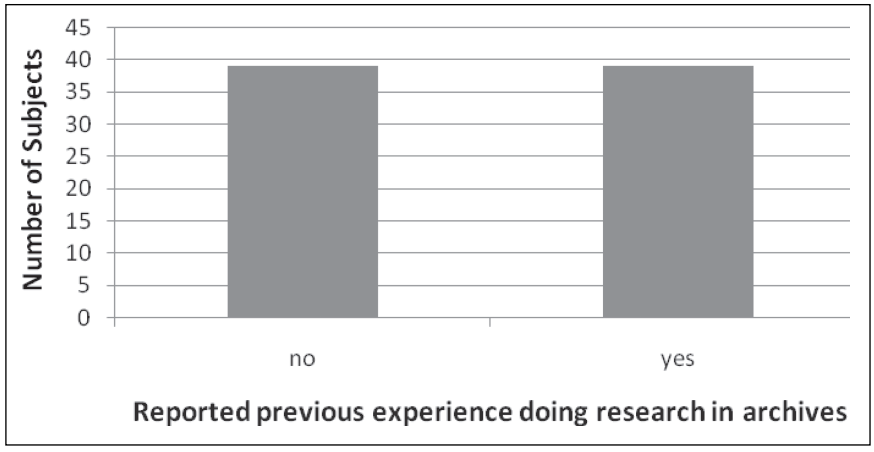

FIGURE 7. **Previous use of archives (*n*=78).**

the total) could ask clarifying questions while they were working, and their comments are illuminating. One subject asked if archives meant back issues of journals, or something similar to a blog archive; another asked if she would know if she had used archives before. It is possible that many of the positive responses to this question were based on a misunderstanding of what archives are; while not possible to say for certain, it would be reasonable to assume that fewer subjects had actual experience conducting research in archives than these data show.

These demographic results indicate that the subjects studied are experienced and fairly savvy online searchers. At the same time, they recognize some limitations to their skills, and their experience is narrow: well versed in Googling and familiar with searching online for more than just textual documents, they rarely use online library catalogs and have only a passing familiarity with what "archives" even means.

Survey

Fifty of the 78 students completed a detailed survey. The questionnaire comprised 4 short sections: 1) previous experience using library catalogs, search engines, and archives; 2–3) two short tasks; and 4) a short demographic questionnaire (see Appendix B). In the first task, participants were given the following prompt:

> Imagine that you are searching in a collection of images (Google Images, for example) and looking for photographs or prints that you could include in a PowerPoint presentation to your class. You have already put in your search terms and got a set of results, and now you have to decide if any of the images you found are things you want to use.

Subjects were then given space to indicate which kinds of information (thumbnail, description, etc.) they felt would help them identify images they would want to use or look at in more detail. The goal for this part of the study was to get a sense of what users want in their own words: a natural language description of each user's ideal set of information.

The second task was a rating task. Participants were presented with the 15 Dublin Core elements and a 5-point Likert scale for each. They were asked to rate the usefulness of each element. No definitions of the elements were given; participants were to rate them based on their own knowledge and experience. If they were unfamiliar with an element, they could select "I don't know what this means." The rating task assessed which elements are unfamiliar to users and their perception of the usefulness of each element.

To ensure a high enough number of participants, the survey was carried out in person in an undergraduate library, a popular study spot. The survey was handed out on paper, but instructions for the survey included a link to an online version if participants preferred to complete it that way. Participants were offered a $5 coffee card for their time. Fifty subjects completed the survey (response rate 85%); 4 of the 50 subjects opted to complete the survey online.

Focus Groups

Eighteen students participated in two focus groups. Each participant first completed the same initial task as the survey participants. Second, as a group, they shared their answers and discussed how they agreed and disagreed with all suggestions. Third, individually, each completed the element rating task from the survey. The worksheets given to the focus groups can be found in Appendix C.

Fourth, as a group, they were asked to sort the 15 Dublin Core elements on index cards into three groups: More Useful, Neutral, and Less Useful. Once they accomplished this, they were asked to rank the cards within the groups.

All decisions had to be unanimous, and each group successfully completed the task within the allowed time period. The final task was, as a group, to come up with a definition for each element.

The goal of this part of the study was similar to that of the survey—to discover what information users believe would be useful to them—and additionally to find out their rationale for listing the information they did. The focus groups yielded information not only about the individual usefulness of the Dublin Core elements and their understandings of what the elements mean, but also what users perceive to be the elements' usefulness relative to one another.

Two focus groups were carried out in study rooms in two separate libraries and audio-recorded. The researcher facilitated them and moderated the discussion. The sessions lasted approximately an hour, and participants were given a $20 Amazon.com gift card at the end of the session. Undergraduates from all majors were eligible to participate. Twenty students were selected randomly from the approximately 150 who responded to the recruiting email; 8 participants attended the first focus group and 10 came to the second.

Search/Usability Testing

In the search/usability testing portion of the study, 10 users were asked to complete two search tasks and reflect on the information they found helpful in choosing images to examine further and then select for use from among their search results. A session with each of 10 participants was carried out in a private study room in an undergraduate library, and participants were given a $20 Amazon.com gift card for their participation.

The test collection was the Claremont Colleges Digital Library (CCDL), selected for several reasons. First, it provides an example of a collection of digitized archival images that adheres to simple Dublin Core metadata. While the metadata varies somewhat across the collections within the CCDL, by and large, the collections adhere to the CCDL's published Dublin Core metadata best practices. Second, CCDL has published its metadata specifications and identified 11 mandatory elements of the 15 possible. The interface used in this collection is CONTENTdm (version 4), a content management system from OCLC. CONTENTdm is one of the most popular off-the-shelf systems, licensed to more than 400 organizations in the United States.[30]

The first task was an orientation task, designed to acquaint users with the search process and the collection, and to make them aware of the information available about the images for which they were searching. The first prompt asked each participant to find an image based on its content: a bullfighter on

[30] Howard Gardner, "Managing Your Digital Resources: CONTENTdm—Overview," presented at the ALA Midwinter Conference, Philadelphia, Penn., 11–16 January 2008.

horseback. Multiple images in the collection fit this description, and participants were asked to find any one of them and identify the title and the date associated with the image. This task familiarized participants with the search results page, the individual item page, and the information contained on both types of pages.

The second search task was more involved. Participants were given the following prompt:

> Imagine you are creating a presentation for a class project on pioneer life in California at the end of the 19th century. The Edward Vischer collection contains images and drawings of landscapes, people and activities related to that topic. Select approximately 5 images from the collection that you feel would be appropriate.

The handouts used in the usability experiments are found in Appendix D.

As in the focus groups, useful information was defined for participants as information that helped them to choose images to look at in more depth (on the search results page), or information that helped them decide whether an image was relevant or not and whether or not to use it (on the individual item record pages). The goal of the usability testing was to find out if the provided DC metadata worked for users: Did they understand all the elements on the page and their content? Which elements did they use and which did they ignore? What information that was not included would they like to have seen, and, conversely, what provided information did they think could have been excluded?

Participants were instructed to think aloud as they searched, identifying what they were looking at while they explored the collection and anything that struck them as confusing or particularly helpful. The sessions were conducted on a PC using Firefox and audio-recorded.

After the tests were completed, I prepared transcripts of each session and coded them to note when and where different elements were mentioned and participants' reactions. Other issues that arose in the course of testing, including complaints about the interface and other nonmetadata concerns, were also recorded.

Findings

The following sections compile and present the findings from the survey, the focus groups, and the usability testing. The first section deals with the question of what users think is useful: their own expressions of what elements or kinds of information would help them navigate an image search. The second section looks at individual Dublin Core elements and what users thought of them, and compares users' perceptions of the usefulness of elements to the ideas they expressed in the first section.

User-Reported "Useful" Elements

The free-response portion of the survey gathered individuals' opinions expressed in their own words of the information useful to them in identifying and selecting images (see Table 2). Sixty-eight undergraduates completed this

Table 2. User-Reported "Useful" Elements

Type of Information	Element	Frequency	Comments
Information about the image gathered from the image itself:	Content (subject)	61	• "The image content is also important, if it doesn't perfectly display what I want, I'll keep searching." (F04) • "First of all, I would click into the website and take a look at the large images/pictures to make sure this is the exact images/pix that I need." (F04)
	Look (aesthetics: black-and-white vs. color; clipart vs. photography; professional vs. amateur; etc.)	38	• "Professional aesthetic (or comic aesthetic if desired)" (F05) • "Clear colorful, and eye-catching" (S12)
Information about using the image gathered from accompanying text or from the surrounding website:	Size (resolution and actual size: 5" × 7", etc.)	35	• "Size of image (high resolution)" (F05)
	Functionality (downloadable, and in what format; croppable; resizable)	18	• "Ability to copy + paste image without distortion" (S48) • "Ability to save the picture in an easily accessible format (JPEG, GIF, etc.)" (F06)
	Rights	9	• "Depending on the project I usually avoid pictures from personal sites/may be copyrighted." (F06)
Information about the image gathered from accompanying text:	**Publisher**	19	• "Website from where the image is from" (S38)
	Description	14	• "Textual descriptions to make sure it is proving a point." (S43) • "Usually, I look in the description for similar words that I typed in." (S38) • "Key words" (F01)
	Title	3	• "Artist's title factors in" (F12)
	Creator	2	• "I would consider the photographer's reputation (National Geographic is better than my neighbor)." (F03)
Information about the image gathered from the collection interface:	Relevance indicators (position in search results list; position relative to other relevant images; etc.)	3	• "If the image is shown in the first few pages of my search" (S01) • "If there are multiple images of the same picture on the results page, then that means it's popular." (F11)

Bolded elements expressed by users align with Dublin Core elements.

portion, given to the survey respondents as well as to the focus groups participants. Their responses fell into 10 element categories: content, look, size, functionality, rights, publisher, description, title, creator, and relevance indicators. These categories, in turn, can be grouped into 4 broad types:

1) Information about the image gathered by looking at the image itself or a thumbnail (content and look);
2) Information about the file and using the file gathered by reading textual information accompanying the image or the website as a whole (size, functionality, and rights);
3) Information about the image gathered by reading accompanying textual information (publisher, description, title, and creator); and
4) Information about the image gathered from clues in the search or collection interface (relevance indicators).

Information about the image gathered by looking at the image or a thumbnail

Respondents most frequently indicated that their primary source of information about an image came from examining the image itself (n=99[31]). Within this group, *content* (n=61) was the most mentioned element, with 61 respondents indicating that this type of information would be useful. *Content* included the subject of the image as well as other artifacts such as watermarks that may have been added to the image. Users indicated that *content* was one of the most critical elements in their decision-making process and often determined whether they continued searching or settled for the image they found: "The image content is also important, if it doesn't perfectly display what I want, I'll keep searching" (F02).[32] They also used content as a quick measure of whether their search was successfully executed or not. One participant noted that search results did not always match his queries in expected ways: "Sometimes you can search for the periodic table and get an image of a celebrity" (F01). One explained that checking the content helped him make an efficient assessment of whether to try a new search strategy. Another aspect subjects brought up was their intended audience: they expressed a need to be able to tell quickly that there was "no mature content" (F05) or "if I think a teacher would approve" (S41).

Participants indicated that, in addition to gathering information about an image's content by looking at it, they also found information about *look*, or the aesthetics of the image (n=38). Participants noted that they examined images for

[31] This n is the number of mentions, not the number of respondents. It is larger than the number of respondents because some subjects mentioned multiple elements that fell into this category.

[32] All subjects were assigned an alphanumeric identifier. The first letter of the code indicates what part of the study they participated in (S = survey; F = focus group; and U = usability/search testing).

their appearance (especially whether they looked professional), as well as for specifics such as the color and color balance, and whether it was clipart, photography, or another genre. They expressed interest in being able to tell if an image is "generic looking" (S02), or "unique, unlike mainstream media" (F03), or that an image is "clean looking" or "visually/aesthetically beautiful" (S15).

Information about the file and using the file gathered by reading textual information accompanying the image or the website as a whole

The second most-mentioned type of information concerned that pertinent to using the images (n=62). *Size* appeared most frequently (n=35). Participants used *size* to mean both resolution and absolute size, and indicated familiarity with the variety of ways this could be expressed. One subject (F12) noted that he checked whether "pixels are listed or words like 'big' or 'life-sized' are used." Related to *size* was *functionality*, the next most-popular element (n=18), which included whether the image could be made larger or smaller, if it was downloadable and what formats it might be available in, and if it could be manipulated. Participants expressed a strong interest in being able to work with images: "I would use an image that resizes well, bigger or smaller" (F03); "The image must be easy to copy and paste" (S38); and to save them locally: "ability to save the picture in an easily accessible format (JPEG, GIF, etc.)" (F06).

Less frequently respondents mentioned information about *rights* (n=9): whether images were copyrighted or otherwise restricted. Information in this category could be gathered either from text accompanying the image itself, or from the general policies of the website hosting the image. Of the 9 subjects who mentioned this element, all but one gave the impression that rights were not a significant barrier: "I check if I am allowed to use it" (S41); "[I look for] how the image is copyrighted and what uses for it are acceptable" (F08). One participant, however, indicated an unwillingness to sort out ambiguous rights situations on an image-by-image basis: "Depending on the project I usually avoid pictures from personal sites/may be copyrighted" (F09).

Information about the image gathered by reading accompanying textual information

Participants also indicated they relied on textual information included with images. Most often, they expressed the need to ensure that an image comes from a reliable website: *publisher* played an important part in their decision whether or not to use an image (n=19). Although no participant actually used the words "publish" or "publisher," 19 indicated that they would find information useful

about "who posted it"(S18), "what site it belongs to" (S42), and "the website it's coming from" (S32).

They also felt a *description* of an image would be useful (n=14); many noted that a description helps to confirm that the image depicts what it appears to depict. The description can be helpful in augmenting the image as well as describing it. One participant indicated that *description* would be useful because she could use it to "look for textual information that I can apply for my project" (S09). Subjects suggested that *title* was similarly useful in reassuring them that the image is what it seems to be (n=3). The final element in this category was *creator*. A few participants (n=2) indicated that they would take the reputation of the artist or photographer into account when looking at images.

Information about the image gathered from clues in the search or collection interface

The final category had more to do with the search process than the image itself. The interface provides some information about images during searching. Three subjects mentioned relying on *relevance indicators* within the interface, such as the image's position in their search results, its placement relative to other relevant images, and indicators of how their search queries relate to the image content. Two participants indicated that relevance information would be useful in helping them shape their search strategies: one "would only look at the first couple pages of search results before refining terms" (F16).

Table 3. Average Usefulness Ratings of Dublin Core Elements*

Element Name	Survey Data	Focus Group Data	Aggregated Data
Subject	4.14	4.28	4.18
Description	4.10	3.39	3.91
Type	3.69	4.06	3.79
Format	3.62	4.22	3.78
Relation	3.58	3.50	3.64
Source	3.78	2.94	3.56
Title	3.76	3.00	3.56
Language	3.39	2.56	3.16
Coverage	3.00	3.11	3.03
Rights	2.94	2.88	2.92
Identifier	2.74	3.00	2.90
Date	2.92	2.78	2.88
Contributor	2.77	2.67	2.74
Creator	2.80	2.56	2.73
Publisher	2.58	2.17	2.47

*No *n* is reported for this table because *n* is different for each element; subjects who marked "I don't know what this is" are not counted. *N* ranged from a low of 41 (Identifier) to a high of 68 (Format, Publisher, Source, Subject, and Title).

User Perceptions of Usefulness of Dublin Core Elements

Table 3 shows a summary of the mean usefulness rating for each element as given by the survey participants and the focus groups, along with an overall average for all the data. Unlike the survey participants, who came into the questionnaire cold, the focus groups discussed metadata elements in image searching before filling out the questionnaire. Because this may have influenced their answers, the average ratings from the focus groups are presented separately from the survey ratings, as well as in the aggregate. Qualitatively, the survey data and focus group data agreed; with the exception of *description*, *format*, *language*, *source*, and *title*, the averages are close together. *Subject* was ranked highest both overall and in the survey and focus group datasets. The ratings for *publisher*, the lowest-ranked element, also agreed.

The focus groups tended toward somewhat lower overall ratings than the survey participants did; the focus groups gave a higher average rating than the survey participants for only 5 elements (*subject, type, format, coverage*, and *identifier*).The Spearman rank-order coefficient, a statistical measure of similarity between ranked lists, however, shows no significant difference between the survey and focus group lists (r_s=0.7179; p=0.001). In addition to rating the elements on their usefulness on a 5-point scale, in both focus groups, participants were asked to sort cards printed with the Dublin Core elements into three groups (More useful, Neutral, and Less useful) and then to order the elements within those groups, as seen in Table 4.

The correlation between the focus groups' full lists is marginally significant based on the Spearman rank-order coefficient (r_s=0.6356; p=0.004). The largest part of the variation is due to just two elements, however: *coverage* and *identifier*. These two elements were unfamiliar to the focus group participants, and disagreement on

Table 4. Dublin Core Element Rankings

	Focus Group 1	Focus Group 2
More useful	subject	description
	relation	format
	description	subject
	identifier	source
	format	date
Neutral	type	relation
	rights	type
	date	creator
	creator	contributor
	contributor	rights
Less useful	source	title
	title	publisher
	language	identifier
	publisher	coverage
	coverage	language

Table 5. Dublin Core Element Rankings

	Focus Group 1	Focus Group 2	Survey
More useful	subject	description	subject
	relation	format	description
	description	subject	type
	identifier	source	format
	format	date	relation
Neutral	type	relation	source
	rights	type	title
	date	creator	language
	creator	contributor	coverage
	contributor	rights	rights
Less useful	source	title	identifier
	title	publisher	date
	language	identifier	contributor
	publisher	coverage	creator
	coverage	language	publisher

their usefulness was based on divergent understandings of their meanings. The relationship between the two focus group lists is stronger when the rankings include only those elements for which they agreed on the meaning (r_s=0.7527; p=0.002).

In Table 5, the final column contains a ranking of the DC elements based on the mean ratings from Table 4. Comparing all three lists using a Friedman test[33] shows no significant difference between the three full lists (X^2=0.3 and p=0.861). Thus, the ranking data (elements compared to one another and ordered) agrees with the individual ratings of the elements (each element considered individually and rated 1 to 5). Overall, this presents a consistent view of elements deemed useful and not.

Across all three parts of the study, participants agreed on the usefulness of the DC elements. Looking at the definitions the focus groups came up with for the elements helps to illuminate why the study subjects made these determinations. The focus group participants' understanding of the individual Dublin Core elements followed particular patterns. Many times, the focus groups came up with definitions that aligned with the actual Dublin Core elements. When their definitions did not agree, the element was either unfamiliar (participants did not recognize the element and were uncertain of its definition) or misunderstood (participants defined the elements incorrectly but confidently). Table 6 summarizes the elements that fell into each of these categories. Table 6 also shows the average usefulness ratings for the individual elements and the three groups.

The average usefulness of the understood terms is somewhat higher than that of misunderstood or unfamiliar terms. The sample size is quite small,

[33] The Friedman rank order test is a nonparametric test of differences across treatment groups. It can be used, as in this case, to measure whether different judges' rankings of a set of items are consistent with each other.

Table 6. Summary of Understanding and Perception of Usefulness of Dublin Core Elements

Focus groups' definitions aligned with Dublin Core		**Focus groups' definitions differed from Dublin Core**			
Elements understood		*Elements misunderstood*		*Elements unfamiliar*	
Creator	2.73	Contributor	2.74	Coverage	3.03
Date	2.88	Publisher	2.47	Identifier	2.90
Description	3.91	Relation	3.64		
Format	3.78	Source	3.56		
Language	3.16				
Rights	2.92				
Subject	4.18				
Title	3.56				
Type	3.79				
Avg. usefulness:	3.43	Avg. usefulness:	3.10	Avg. usefulness:	2.97

though, so these numbers may not be reliable. Overall, the averages are quite close to each other; this clustering may be due to the respondents' tendency to preferentially select a middle rating when one is offered rather than extremes.[34]

Discussion

This section explores in more depth the ways in which the data from the survey, focus groups, and usability testing aligned and the ways in which they diverged. It also addresses how Dublin Core either matches or does not match the evidence of what is useful to users based on their responses and actions in all three parts of this study. Selected results relating to individual Dublin Core elements are also presented.

Survey and focus group participants suggested a number of types of information they perceived to be useful that aligns with information provided by Dublin Core elements. Specifically, they mentioned *description* or *subject*, *publisher*, *rights*, *title*, and *creator*. The rankings and reported needs match up well for some of these elements, such as *description* and *subject*, which a large number of participants suggested and ranked highly. In contrast, *title* and *creator*, mentioned by far fewer subjects, fell much lower on the list.

One strength of Dublin Core is its accessible vocabulary. In the words of one usability participant, "It's just like really generic words . . . they're nice words that everyone can just see and understand what's coming next" (U06). A danger, however, is that users may see a word that they think they understand, but the element definition is not what they expect, for example, the term *relation*, as seen in Table 7.

[34] For more on this phenomenon, see Howard Schuman and Stanley Presser, eds., *Questions and Answers in Attitude Surveys: Experiments on Question Form, Wording and Context* (New York: Academic, 1981).

Table 7. Definitions of the Element *Relation*

Dublin Core definition:	A related resource.
Focus Group 1 definition:	Relevance to your search terms.
Focus Group 2 definition:	How the image is relevant.

Both focus groups defined *relation* as relevance, and usability participants had much the same idea. As one participant in the first focus group said, *relation* was interpreted as "relation to what you're looking for." Some usability participants interpreted the term similarly and indicated that the contents of the field did not match up to what they expected to see: "And relation, like, that would seem like how it relates to my search, but that's nothing to do with it actually" (U01). Others were unable to determine what the field meant, despite being able to see the information the field contained: " . . . I don't really know what that means, I guess. Like, relation to what?" (U09). "I don't really know what relation means, at least in this context" (U07). While the Dublin Core definition of *relation* does not clearly line up with any of the kinds of useful information suggested by participants in the free-response task, the focus groups' definitions align with their expressed desire for relevance feedback.

Conversely, an often-mentioned but low-ranked element was *publisher*. In the free-response task, *publisher* was mentioned 19 times. The focus groups, however, ranked the element 14th and 12th overall, and the only usability participant who mentioned it only noted that she "wasn't too concerned with [it]" (U07). The focus group definitions reveal the cause of this discrepancy as seen in Table 8.

When describing the information they would look for, survey participants noted that they needed information about the website from which an image came and about the person or entity that put the image there. This aligns with the Dublin Core definition of *publisher*, but the study participants perceived the term to mean something different. Every participant indicated that they knew what *publisher* meant, but they thought of it in terms of the print publisher (if the image originally appeared in a newspaper or magazine) or of the rights holder. As noted, no participant in the free-response section actually used the word "publisher" in connection with that information.

Table 8. Definitions of the Element *Publisher*

Dublin Core definition:	An entity responsible for making the resource available.
Focus Group 1 definition:	The rights-holder (the creator or whoever bought the image from the creator).
Focus Group 2 definition:	The name of the publisher if it was a professional picture and was in the newspaper, etc.

Table 9. Definitions of the Element *Source*

Dublin Core definition:	A related resource from which the described resource is derived.
Focus Group 1 definition:	The website where the image came from.
Focus Group 2 definition:	Where the image is from, the website.

The Dublin Core definition of *publisher* aligns much more closely with the focus groups' definition of *source*, an element that they perceived to be more useful as seen in Table 9.

Both focus groups defined *source* as the element that would give them information about the website; the relatively high ranking of *source* among the focus group and survey participants contrasted with the low opinion of *source* expressed by the usability subjects, who saw the element in context. The usability participants understood *source* according to the Dublin Core definition because they could see the information in the field. They did not see it as important information, however: "I guess the source I didn't really need to know" (U06) and suggested it could be left out or hidden.

The focus groups' and survey participants' interpretation of *source* speaks to an understanding of the term based on a common usage of the word. Students are continually exhorted to cite their *sources*; images online have a *source* URL. *Source* does have a meaning in the context of the digital world, and when users are working in an online environment, that meaning is perhaps a more natural fit than the Dublin Core definition that has to do with a physical source. In cases where an archives is the publisher but not the rights holder or when the source is unknown, confusion among users between the meanings of *source* and *publisher* may be especially problematic.

Subjects consistently rated *type* and *format* highly. In both cases, the focus group definitions were narrower than the Dublin Core definitions and focused primarily on usage issues, another major area of concern in the self-reported section. Usability participants mentioned these two elements multiple times as being unhelpful or confusing. The discrepancy between the ranking/reported need and the experience of the usability subjects may be due to the implementation of both elements in the CCDL. Participants imagined *type* to mean the genre of the image ("landscape," etc.), while the CCDL's use of the field has to do with the digital object (regardless of whether they are images of textual documents, paintings, etc., all scanned objects have "image" as their *type*). Participants singled out *format* because, while they understood that the information in the element was the file format, they did not recognize the file extensions being used (JP2). *Coverage* addresses image content, where participants reported most of their information needs. Very few subjects, however, knew what the term meant; some in the usability testing were able to figure it out from context and make use of the information, but others were unable to do so.

Many searchers, especially inexperienced ones, are easily stymied by unfamiliar terms. As one usability subject noted, "I think I thought things were irrelevant because I didn't really know what they meant" (U09). The undergraduate participants in this study relied heavily on the images themselves when making their decisions, and when presented with dense text or words they did not know, sometimes gave up on the text entirely: "I just see a lot of words that I don't really want to look through right now" (U06).

Despite some complaints about the interface, addressed in more detail below, there was good agreement between what users wanted and what Dublin Core provides, and the average searcher understood many of the elements, particularly those that users perceived to be useful. All participants reported that the CCDL was easy to use: it was "simple, easy to understand" (U01); "pretty good if you know it exists" (U03); and "well thought out . . . a good database, easy to search" (U08). Their complaints dealt less with the information provided and the terms in which it was expressed and more with the visual presentation.

By and large, subjects wanted more information about content (more "tags," more description) and more functionality and support for exploring images: "you could zoom in on the tiny details and explain what it is, why the artist put it there, how it relates to the picture" (U01); "If I mouseover, then a description appears, maybe. . . . So I would put the things that are most important together, like title, date, subject, source and if you needed more information you could go over here" (U05). They were less interested in what they perceived to be "technical stuff" such as format and type.

The most interesting results, though, appear to be a consequence of the priming that occurs when users are very experienced in one particular method and interface for searching. In this case, all participants were accustomed to searching with Google. The elements they considered most useful are those implemented in Google. Although it is not possible to differentiate whether users rated those elements highly in this study because they were accustomed to looking for and working with them or because the elements that Google presents are truly the most useful, this agreement supports the idea that text relating to content (*subject*, *description*) is very useful to searchers.

Their experience with search engines heavily influenced the way the participants perceived and understood textual information. Nearly all the usability subjects, for example, mentioned using the *subject* field to help them in their searching. Few used the word "subject"; "tag" seemed to be a more natural fit: "This one is tagged under 'frontier and pioneer life,' so I'm going to click that" (U08); "Frontier and pioneer life is one of the tags" (U07).

Relation has already been discussed in part but another dimension surfaced in light of users' experiences with Google. Google presents relevance information in the form of ordering within the search results and page snippets containing bolded or highlighted words that match search terms. Searchers are

used to working with this information and are, to some extent, primed to look for it. This expectation, along with the simplicity of the Dublin Core terms, may explain why both focus groups and many of the usability subjects seized on the interpretation of *relation* as "relevance": they expected to see relevance information in some form, and *relation* would seem to be the most likely field in which to find it.

The lesson here is, perhaps, that no one, not even the novice searcher, is a blank slate. Users bring expectations and understandings that they draw on to make sense of information presented to them. For better or worse, the use of commercial search engines forms the bulk of individuals' search experience; most searchers come to digital libraries with extensive experience in online searching within an environment like Google or Yahoo, and that informs their actions and the way they interact with information online. In particular, when presented with unfamiliar or difficult-to-understand information, the subjects in this study fell back on what they knew from their past search experiences and looked for things that could line up with what they already knew. Thus, they interpreted *relation* as "relevance" and mistook *source* for "publisher." Furthermore, they deprecated *coverage*, an element that gave them information that aligned with what they expressed as most useful, because they did not recognize the term.

This study shows that nonexpert users perceived Dublin Core to be sufficient, and usability participants had few complaints about needing more information. However, subjects did experience difficulty with some Dublin Core elements that were incomprehensible to them or that they mistakenly assumed to mean something other than what was intended. The most frequently misunderstood elements (*source*, *publisher*, and *relation*) are also those most crucial for understanding archival materials; because these elements have to do with evidence and context, it is especially important for users to be able to understand the information these elements represent. These results point to the importance of designing a metadata schema (or at least the labeling and presentation of the elements) that aligns with what users know and understand, as well as with the vocabularies they use to express information. Additionally, these results suggest a need to consider whether some elements are more critical for understanding some types of materials (e.g., archival materials) than others.

Nontextual Information and Interface Issues

Although interface and system design issues are not strictly within the scope of this study, survey and focus group participants suggested aspects of interfaces they found as sources of useful information, and usability subjects commented on ways that the CCDL interface affected the usefulness of some metadata elements.

Six of the 10 usability participants indicated that they looked first at the thumbnail when they examined their search results, and, for 4, the image itself was the most useful piece of information throughout the search. For some, the textual information was a backup to the image: "Like some of them I couldn't see the thumbnail really good, so I looked at the subject to see what it was"(U01). Another user confirmed that when the image was clearly visible, textual information was extraneous: "I didn't really read it much, I didn't need that information. I just looked at the picture. I scrolled down, I guess out of habit, but I didn't read anything" (U05). This observation conforms with users' self-reported information needs: by far, the most frequently mentioned useful piece of information was the image itself.

These responses suggest that interface design can affect how useful the textual metadata associated with images is perceived to be. The CCDL search results pages included small thumbnails; because the images were too small to see clearly, subjects looked to the metadata for clarification and more information. Where the text was dense or difficult to scan, the usability participants relied more heavily on information they could glean from the images themselves.

Conclusions and Future Directions

This study suggests that the content and terminology of Dublin Core provide useful and appropriate information to nonexpert users, who understood most elements correctly, especially when presented in context. The interface, however, can hinder the perceived usefulness of some elements, especially when an abundance of text caused the user to skip over everything. Nonexpert users perceived some elements to be less useful simply because the terms were unfamiliar (e.g., *coverage*). However, many of the most misunderstood terms (*relation*, *publisher, source*) may be more important for understanding archival sources and using them as evidence than other terms are.

Thus, while the limited information contained in simple Dublin Core appears to be sufficient for identifying and selecting images, larger issues concerning the use of images require further investigation. A major concern is ensuring that the information is presented in a way that supports exploration of individual images and collections as a whole. Participants in this study indicated that the most useful information is the content of images and how images can be used; they expressed a desire to see that information front and center. They acknowledged that technical and other more detailed information is important, but not in all cases, and indicated that it should be differentiated from content and usage information.

Archives typically offer collection-level descriptions of materials; this is problematic for online access to individual items, especially in the case of visual

images. Metadata creation and management costs, however, can be high, so one approach to dealing with this constriction is to catalog images individually with limited metadata, as exemplified by CCDL's use of Dublin Core. It is important to analyze how well these simple metadata work for users; knowledge of how users work with and search for items when they are individually cataloged can inform collection-level description and allow better access to collections at all levels. Additionally, an understanding of what users need is a necessary foundation for determining what balance of process is needed to allow users to find, access, and use the products made available to them.

Appendix A: Demographic Information Questionnaire

All study subjects involved in the survey, focus groups, and usability testing completed the following questionnaire.

1. What is your current **academic level?**

   Freshman ☐ Junior ☐
   Sophomore ☐ Senior ☐

2. What is your **major/concentration**? _____

Library and Archive Use

3. Have you ever used an **online library catalog** (Mirlyn, for example)?

   If YES:
   a. **In the past year**, how often did you access an online library catalog?

   Almost every day ☐ A few times a year ☐
   A few times a week ☐ Never ☐
   Two or three times a month ☐

   No ☐

4. Have you ever used **archives** for an assignment or for your own research?

   Yes ☐ No ☐

Online Searching

5. How often do you use Google or another search engine?

   Almost every day ☐ A few times a year ☐
   A few times a week ☐ Never ☐
   Two or three times a month ☐

6. How often do you search for images using Google Image Search, Flickr, or another service?

Almost every day	☐	A few times a year	☐
A few times a week	☐	Never	☐
Two or three times a month	☐		

7. Which statement below best describes your ability to search for and find information online?

It is usually hard for me to find what I'm looking for	☐
It is sometimes hard for me to find what I'm looking for	☐
It is occasionally hard for me to find what I'm looking for	☐
It is rarely hard for me to find what I'm looking for	☐
It is never hard for me to find what I'm looking for	☐

Appendix B: Survey Form

Thank you for agreeing to take part in this survey. If you prefer, you can take this survey online at the following URL:

http://umich.edu/~kfear/survey.html

This survey has four parts: a short section with questions about your library and search engine use, two task-based sections that have to do with the kind of information you would need to search for images in an online collection, and a brief demographic questionnaire.

It shouldn't take you longer than 15 minutes to complete this survey, although you are welcome to take longer if you need the time. If you have questions about this survey or this research project, please contact Kathleen Fear (kfear@umich.edu).

Section 1

1. In the past year, how often did you use an online library catalog (Mirlyn, for example)?

   ☐ Almost every day ☐ A few times a year
   ☐ A few times a week ☐ Never
   ☐ Two or three times a month

2. Have you ever used archives for an assignment or your own research?

   ☐ Yes ☐ No

3. How often do you use Google or another search engine?

   ☐ Almost every day ☐ A few times a year
   ☐ A few times a week ☐ Never
   ☐ Two or three times a month

4. How often do you search for images using Google Image Search, Flickr, or another service?

   ☐ Almost every day ☐ A few times a year
   ☐ A few times a week ☐ Never
   ☐ Two or three times a month

5. Which statement below best describes how hard it is for you to search for and find information online?

   ☐ I usually have a hard time finding what I'm looking for

   ☐ It is sometimes hard for me to find what I'm looking for

   ☐ It is occasionally hard for me to find what I'm looking for

   ☐ It is rarely hard for me to find what I'm looking for

   ☐ It is never hard for me to find what I'm looking for

Section 2

Imagine that you are searching in a collection of images (Google Images, for example) and looking for photographs or prints that you could include in a PowerPoint presentation to your class. You have already put in your search terms and got a set of results, and now you have to decide if any of the images you found are things you want to use.

How will you decide whether or not to use a particular image? Please use the space below to list any information or features you feel would be very useful in helping you make your decision. This can include things that you see (like a thumbnail or other visual) or textual information associated with an image (like a description).

Section 3

The following is a list of information that describes an image: which of these pieces of information would help you make a decision about whether to use an image or not? For each one, please rate it on a scale of 1 to 5, where 1 means "This is not useful at all" and 5 means "This information is definitely useful." If you don't know what something means, please circle "I don't know what this means."

	Not useful at all				Definitely useful	
Contributor	1	2	3	4	5	I don't know what this means
Coverage	1	2	3	4	5	I don't know what this means
Creator	1	2	3	4	5	I don't know what this means
Date	1	2	3	4	5	I don't know what this means
Description	1	2	3	4	5	I don't know what this means
Format	1	2	3	4	5	I don't know what this means
Identifier	1	2	3	4	5	I don't know what this means
Language	1	2	3	4	5	I don't know what this means
Publisher	1	2	3	4	5	I don't know what this means
Relation	1	2	3	4	5	I don't know what this means
Rights	1	2	3	4	5	I don't know what this means
Source	1	2	3	4	5	I don't know what this means
Subject	1	2	3	4	5	I don't know what this means
Title	1	2	3	4	5	I don't know what this means
Type	1	2	3	4	5	I don't know what this means

Section 4

1. What is your field of study?
2. Please note your year of study:

☐ Freshman ☐ Senior
☐ Sophomore ☐ Graduate or Professional Student
☐ Junior ☐ Other (please specify)

3. Do you have any additional questions or comments?

This is the end of the survey. Thank you for your participation! If you would like more information about this research, a brief explanation is on the back of this sheet.

Appendix C: Focus Group Task Forms

These handouts were given to the focus groups and contain the same tasks as were completed by the survey participants.

Section 2

Imagine that you are searching in a collection of images (Google Images, for example) and looking for photographs or prints that you could include in a PowerPoint presentation to your class. You have already put in your search terms and got a set of results, and now you have to decide if any of the images you found are things you want to use.

What information would you need to make a decision about whether or not to use a particular image? Please list any information you feel would be very useful in helping you make your decision.

You will have 10 minutes to complete this task.

Section 3

The second task has to do with putting some kinds of information in order. Imagine that while you are searching for images as before, you are presented with the following 15 kinds of information. Please rate each one in terms of how useful it would be in helping you make your decision whether or not to use a particular image. You will have 5 minutes to complete this task.

	Not useful at all				Definitely useful	
Contributor	1	2	3	4	5	I don't know what this means
Coverage	1	2	3	4	5	I don't know what this means
Creator	1	2	3	4	5	I don't know what this means
Date	1	2	3	4	5	I don't know what this means
Description	1	2	3	4	5	I don't know what this means
Format	1	2	3	4	5	I don't know what this means
Identifier	1	2	3	4	5	I don't know what this means
Language	1	2	3	4	5	I don't know what this means
Publisher	1	2	3	4	5	I don't know what this means
Relation	1	2	3	4	5	I don't know what this means
Rights	1	2	3	4	5	I don't know what this means
Source	1	2	3	4	5	I don't know what this means
Subject	1	2	3	4	5	I don't know what this means
Title	1	2	3	4	5	I don't know what this means
Type	1	2	3	4	5	I don't know what this means

Appendix D: Usability Testing Task Forms

The forms on the following pages were given to usability testing participants. The first two forms are task forms, and the final section is a set of reflection questions.

Section 2
The purpose of this first part of the study is to familiarize you with the collection you'll be searching in.

The browser you are using has the home page of the Edward Vischer drawings, photographs and other material collection set as its home page. You can hit the "home" button at any time to get back to this page.

The search and browse functions are on the right hand side of the page. Using any of the options available, please find an image of a bullfighter on horseback.

When you find an image that you feel fits these criteria, write down its title: _____

Please also try to find the date of the picture and write it down: _____

While you are searching, please think out loud. Don't just say what you are doing, though—please try to say what you see and why you are taking the actions that you do. If you stop thinking aloud, I will ask some questions to prompt you.

You will have 10 minutes to complete this task.

Section 3
This part of the testing will be similar to the task you just completed.

Imagine you are creating a presentation for a class project on pioneer life in California at the end of the 19th century. The Edward Vischer collection contains images and drawings of landscapes, people and activities related to that topic.

Select approximately 5 images from the collection you feel would be appropriate.

Write down their titles as you decide on which images to use:

1.

2.

3.

4.

5.

Please think aloud as you perform your search. You will have 20 minutes to complete your search.

Section 4

1. When looking at the list of search results, what piece of information did you look at **first**?

   a. the thumbnail
   b. the title of the image
   c. the subject
   d. the description

2. When looking at the list of search results, what piece of information was **most useful** in helping you decide which images to view the full record for?

   a. the thumbnail
   b. the title of the image
   c. the subject
   d. the description

3. Was there any information on the search results page that you found **confusing or irrelevant**? List the information below.
4. Is there any **additional** information that would be useful to have on the search results page that wasn't there? List the information below.
5. When looking at the individual item record, what piece of information was **most useful**?
6. When looking at individual item records, what piece of information did you look at **first**?
7. Was there any information in the individual item record that you found **confusing or irrelevant**? List the information below.
8. Did you come across any terms you did not know?
9. Is there any **additional** information that would be useful to have on the individual item record that wasn't there? List the information below.