

Bridget E. Madden. Online Visual Image Resources and Reference Services: Understanding Preferred Resources. A Master's Paper for the M.S. in L.S degree. April, 2010. 59 pages. Advisor: Jeffrey Pomerantz.

As students and teachers in higher education begin to use images in their courses, assignments, and research more frequently, new skills and literacies are needed to find and use images on the Web. Images can be found online in several different types of resources, including subscription image databases, freely available digital libraries and collections, user-generated collections such as Flickr or Picasa, and the general Web. Academic libraries and librarians can serve the image needs of their users by providing access to online image resources and visual literacy instruction. This paper presents a research study that explored the types of image reference questions librarians receive, the resources they use most often, and the difficulties of searching for images online.

Headings:

Digital Images

Pictures/Database

Reference services (Libraries) – Academic library Reference Service

Visual Literacy

ONLINE VISUAL IMAGE RESOURCES AND REFERENCE SERVICES:
UNDERSTANDING PREFERRED RESOURCES

by
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A Master's paper submitted to the faculty
of the School of Information and Library Science
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science in
Library Science.

Chapel Hill, North Carolina

April 2010

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Introduction

The Web provides access to an extensive amount of visual image content through various means, including user generated photo websites like Flickr and Picasa, image search engines including Google Images, and a wide variety of digital libraries and virtual exhibits that often display cultural heritage content. Discovering this image content is becoming increasingly important for students and faculty doing academic research, and academic reference libraries are charged with supporting that research and the resources necessary to find and use visual images. Digital images are attractive to professors, researchers, and students in all disciplines because of their many affordances, including the ability to download the file, manipulate the image, insert it into word processing and presentation software, and access it through collections on the Web (Snavely, 2005).

The use of visual materials in academic research has been increasing since scholars became particularly interested in social history during the 1970s and began using photos, ephemera, and other visual resources to support their research in the social sciences and humanities. Images are not limited to the disciplines within these fields, but rather apparent across all disciplines including the health sciences, arts and design, and so on. In addition, many disciplines have started generating images as technology advances in their fields. Medical imagery, cognitive science, and computer-aided architectural renderings are just a few examples of categories of generated images that academic library users may be trying to find and cite. Despite the demand for and demonstrated

use of images in current scholarship, students have difficulty finding and citing images in their research (Harris, 2007).

The information seeking strategy for finding images on the web depends on the type of system the images are contained in. The two types of image search engines and indexing systems are those that are concept-based, which are most common, and content-based, which are less common. Concept-based image retrieval systems require the user to input search terms or keywords that the system checks against a database of images that have been described and indexed on the basis of the image's context, including information about its creator, location, subject matter, and other descriptive metadata fields (Enser, 2008). Most subscription image collections, such as ARTstor and the AP Photo archive are concept-based systems, as are freely available digital library image collections, including the Collection Database of the Metropolitan Museum of Art, the American Memory project of the Library of Congress and many image collections hosted by colleges.

Alternatively, in content-based image retrieval systems, the user inputs colors and shapes that the system checks against a database of images that have been indexed and described at the physical level, including the attributes of size, shape, color, and line (Enser, 2008). The State Hermitage Museum in St. Petersburg, Russia, employs the QBIC (Query by Image Content) system designed by IBM, as a content-based image search engine for its digital collections. Users can produce a virtual sketch of their query on the QBIC canvas, and the search engine will retrieve results that have similar visual characteristics as the shapes and colors entered by the user. The *retrievr* search engine (<http://labs.systemone.at/retrievr/>) is another example of CBIR technology, and users can

either search by a sketch or by uploading an image file to search for similar images.

Despite advances in content-based image retrieval systems, most resources available on the Web are concept-based. Furthermore, most image collections generated or hosted locally by academic and cultural heritage institutions used concept-based indexing procedures where natural language descriptions are written about the image and subject headings are manually applied.

These two types of image retrieval systems present users with very different interface experiences. Concept-based systems rely on traditional text search boxes. In some digital libraries or image systems, it is possible to browse or navigate through controlled vocabulary terms. Content-based systems present a significantly different interface in which the user interacts with a blank canvas rather than a traditional search box. The experience of searching for images on the Web is also benefitted from recent developments in internet applications that are meant to aid in image discovery. Products such as Cooliris and Google Image Swirl straddle the two types of image retrieval systems in order to group images by their context (description, tags, metadata) as well as their image content and likeness. With more images and visual content available online, users have the opportunity to access a wealth of visual resources; however, recent studies of image retrieval suggests that users still have difficulty navigating online collections, articulating successful queries, discovering relevant images, and determining the quality, authenticity, and proper rights of use.

Studies of users' online image seeking behavior have pointed out a large semantic gap between the way that visual materials are indexed and described in digital collections (concept-based systems), and the way that users construct queries or browse through site

architecture as they try to find images (Bates, 1998; Goodrum, 2005). These user studies are often conducted to assess interface design or to research querying behavior, but they are limited because they often artificially assign an audience to a particular collection. Because so many of these image resources are freely available on the Web, the potential audience or typical users are difficult to define. In academic libraries, users can access images through subscription databases and union collections like ARTStor and CAMIO (RLG's Catalog of Art Museum Images Online). Academic libraries are also generating a lot of visual image content and displaying it freely on the Web through their own institutional digital collections programs.

The research on image retrieval suggests that users have difficulty discovering images in online collections. Finding, evaluating, using, and citing images requires certain skills of the user, and these skills are not directly addressed by current information literacy standards. Information literacy instruction addresses contemporary problems in finding and using information in a variety of formats, but does not specifically discuss visual images. The role of human mediation in searching for visual images has been studied in both analog and digital contexts (Westman & Oittinen, 2006; Goodrum 2005). Studies of how librarians mediate user requests in digital libraries, through digital reference services and in person can suggest ways in which librarians can demonstrate how online resources are being used and taught. The long history and significance of human mediation in finding images also suggests that it is crucial to know what resources and techniques practitioners in the field are using to help users find and cite digital images. A response in the library community has been to develop visual literacy techniques and standards.

Visual literacy can be understood as a subset or an offshoot of information literacy (Harris, 2007; Rockenbach & Fabian, 2008). In searching for images, users need to determine not only what is relevant to their research, but they must also make decisions regarding the image's authority, authenticity, quality, and acceptable uses. In higher education, students and faculty have been using images at an increasing rate since the 1970s, and libraries have responded to this increasing demand by making visual image collections more findable or visible to users. Earlier it may have been sufficient to catalog or create finding aids for visual material, but currently, academic libraries increase access to visual material on the web by creating digital collections of image from slide libraries and special collections in addition to purchasing subscription image databases. Libraries may also provide links to image resources created by other institutions if they are freely available on the web.

There are many tangential but important concerns to consider as students and professors need good technical and evaluative skills to successfully use images in their research. The process of evaluating text on the Web differs from evaluating images in the sense that users examine text based on the qualities of its topicality, comprehension, and utility. Likewise, image seekers evaluate images on their topicality and utility, but depart drastically from the concept of being able to comprehend or understand the image: instead, users consider the image's "meaning," an evaluative concept that is always dependent on the user's context. (Griesdorf & O'Connor, 2002).

Discovering images online can be difficult because of the semantic gap between the words used to describe images in databases and the ideas the user has of the image's properties. Understanding where users are having difficulty in online image seeking is

knowledge that is traditionally applied to user interface design. However, this knowledge can also be applied to the design of reference and instructional services. It is important to critically examine how users find and use images online in order to develop best practices for library instruction that specifically address user needs. Searching for visual images online departs from seeking textual information on the Web because of the nuanced ways images can be described and interpreted. It also differs from conducting research in photographic archives, vertical files, ephemera collections, and other physical image collections such as slide libraries because the user may be remotely accessing the collection and unable to contact an expert or other intermediary familiar with the material. Because searching for images on the web is difficult, it begs for a different approach to mediation and reference interactions. Human mediation (in the form of reference librarians, archivists, and instructors) can be combined with value-added digital services in order to empower the user and make the image seeking experience more successful. By looking into the current state of practice of image reference, professionals can begin to see which resources are successful or popular, and where there is room for developing new or better instructional designs. This research seeks to address the following two questions:

1. How do reference librarians at academic institutions engage in elements of visual literacy education?
2. What are the tools, collections, or databases that librarians use to meet users' image information needs?

Literature Review

The literature and research concerning visual information seeking behavior and visual literacy is vast, but this literature review will examine articles related to image indexing and retrieval, image seeking behavior, visual image needs in academic institutions, and visual literacy in order to provide a context with which to identify the ways in which librarians provide image reference services. Using research about image retrieval systems to supplement the literature about visual literacy instruction and reference services in academic libraries will help reveal the difficulty in image seeking. Furthermore, it emphasizes the need for librarians to serve as intermediaries in the image seeking process in colleges and universities, where images are sought for research in a variety of academic disciplines.

Image Indexing and Image Retrieval Systems

There are two main types of image retrieval systems – concept-based and content-based systems. Concept-based image retrieval systems rely heavily on indexing standards, controlled vocabularies, ontologies, natural language descriptions, folksonomies, and other associated text to catalog images so they can be discovered (Neal, 2009). Choi and Rasmussen (2003) provide a good, historical review of the theoretical ways of conceiving image subject and analysis. While text has clear access points for cataloging purposes, images have less clear (or broader) access points because images can be relevant, appropriate, and useful in a wide variety of unpredictable

contexts (Choi & Rasmussen, 2003; Enser, 2008). Given that, Choi and Rasmussen note that cataloging and indexing practices in digital collections often focus on a specific discrete collection or describe material from the perspective of a particular discipline even though the items in the collection may have interdisciplinary relevance (2003). Concept-based image retrieval systems are at the heart of many image search engines and professionally maintained digital libraries of images.

Several different subject-specific thesauri have been developed to help classify visual images, including the Getty's *Art and Architecture Thesaurus* and the Library of Congress' *Thesaurus for Graphic Materials*. However, research suggests that there is a gap between the thesaurus terms used by professionals to index images, and the language users use to search for images (Goodrum, 2005). The textual description of visual images does not need to be created by professionals; in fact, photo-sharing websites that allow and encourage users to generate tags for images also produces textual descriptions of images for search and retrieval purposes. Yoon argues that social tagging on Flickr, a photo-sharing website, allows users to classify images according to their own image retrieval needs (2009). The differences between user-generated tags and the terms in professionally created thesauri provide different kinds of subject access to images, and after comparing data sets of user-generated tags to various controlled vocabulary, Yoon recommends that professionals combine structured thesaurus terms with user-supplied keywords in order to increase the effectiveness of the image retrieval system (2009).

The search interfaces for the web search engine Google Images, Flickr and Duke University Libraries Digital Collections are examples of content-based image retrieval systems. There is a significant distinction between professionally managed image

collections like those at Duke University Libraries and images found on the web (Enser, 2009) in the way images are described and indexed. For images indexed in web search engines, and the system searches through HTML tags and “collateral text data” (Enser, 2009) in order to return relevant results. The difference is complicated by the fact that web search engines such as Google Images may often return results from professionally managed collections. In addition, photo-sharing web sites such as Flickr index images through user-generated tags. The search boxes for these types of resources present the user with a text box to enter queries.



FIG. 1. Screenshot of the Google Images search interface showing a text search box. (<http://www.images.google.com>)

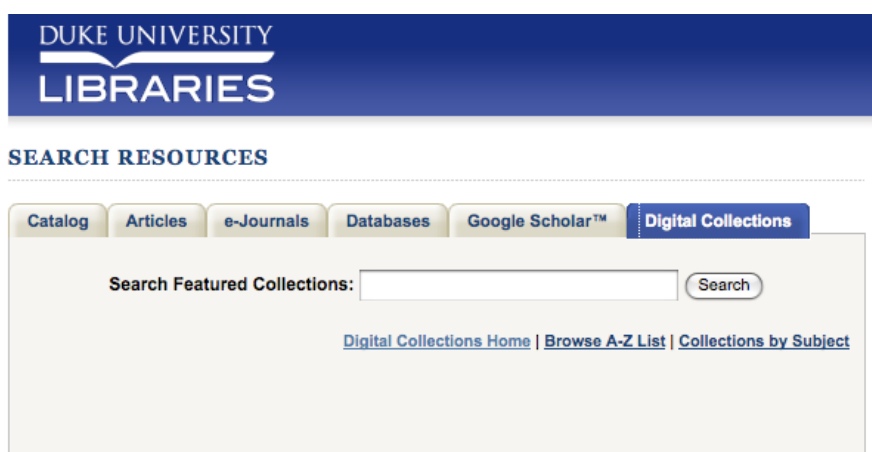


FIG 2. Screenshot of the Duke University Libraries catalog, showing the search box for their digital collections. (<http://library.duke.edu/>)

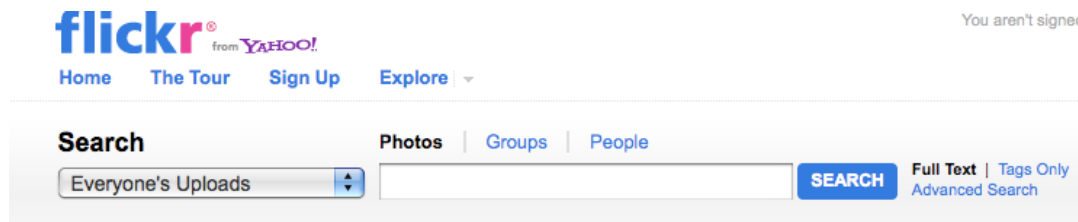


FIG. 3. Screenshot of the photo-sharing website Flickr, showing a text search box. (www.flickr.com)

As evidenced in Figures 1, 2, and 3, concept-based systems give priority to text – users must translate their visual information needs into queries, using either natural language queries or controlled vocabularies. While it may be difficult to construct appropriate keyword searches given the limits of manually applied metadata, concept-based retrieval systems such as these are good for known-item image searching (Choi & Rasmussen, 2003).

Less common are content-based image retrieval systems (CBIR), which rely on the physical and quantifiable aspects of an image, including shape, line, color, and pixel location, to return relevant results (Enser, 2008). The State Hermitage Museum in St. Petersburg, Russia, uses a CBIR system for its digital collections that was developed by IBM and is known as Query by Image Content (QBIC). Users of the digital collection can search by color or layout, and the search interface presents a color palate, shapes, and a blank canvas for users to express their query visually.

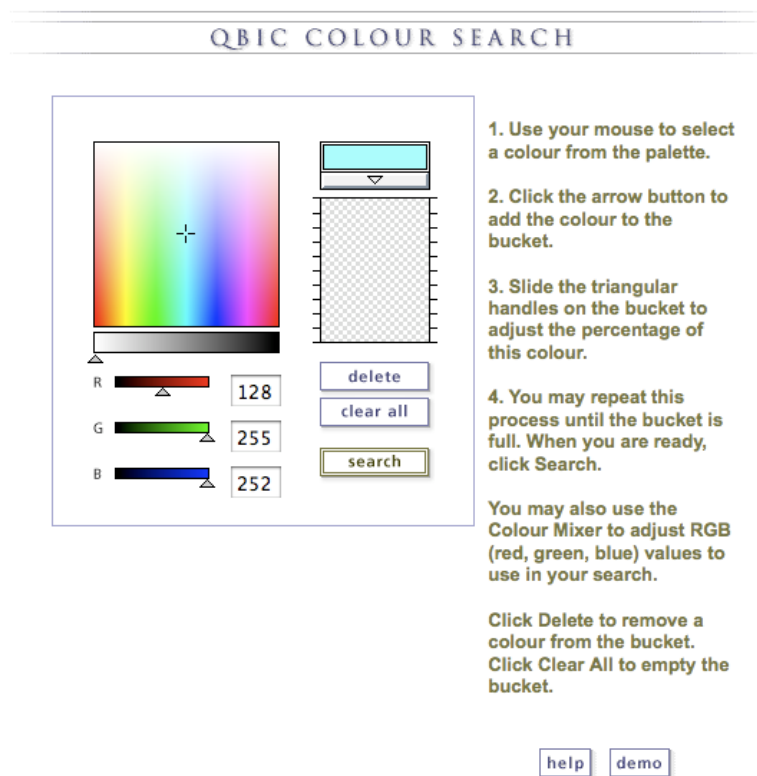


FIG 4. Screenshot of the search by color interface of the digital collection at the State Hermitage Museum in St. Petersburg, Russia. (<http://www.hermitagemuseum.org/cgi-bin/db2www/qbicSearch.mac/qbic?selLang=English>)

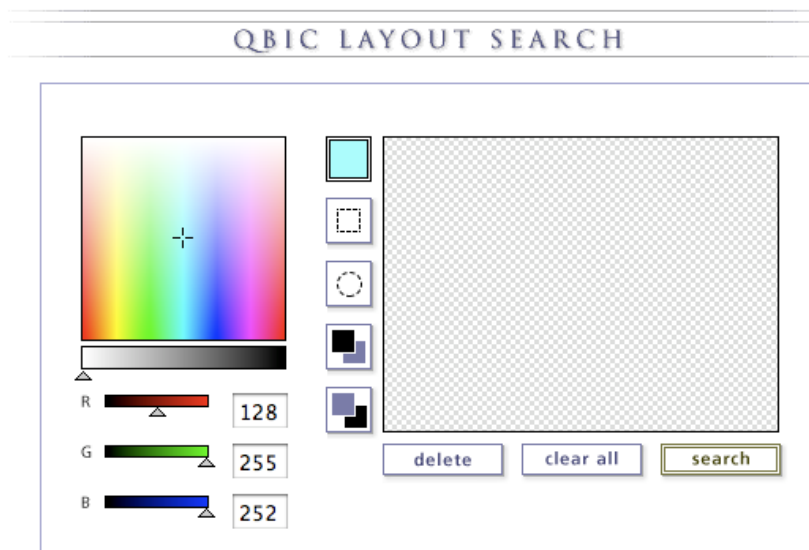


FIG. 5. Screenshot of the search by color layout of the digital collection at the State Hermitage Museum in St. Petersburg, Russia. (<http://www.hermitagemuseum.org/cgi-bin/db2www/qbicSearch.mac/qbic?selLang=English>)

As seen in Figures 4 and 5, CBIR systems demonstrate a very different search interface than the text search boxes seen in Figures 1, 2 and 3. While CBIR systems have their own limitations, they provide a supplementary service to the ubiquitous concept-based systems.

Studies of User Behavior and Needs in Digital Image Collections

The web is highly conducive to displaying graphical information, and there is an exponential amount of image content available online through collections as well as the general web. User studies of digital image collections tend to focus on a particular user group or a specific collection, similarly to user studies of physical photograph archives before the advent of digital library technology. There has also been significant research conducted to learn more about how users find images using web search engines. As discussed earlier, there is a difference between how images on the web and images in professionally maintained image collections are described and indexed. The analysis of user tendencies when image searching on the web can supplement the analysis of professionally maintained digital collections by demonstrating general patterns of image seeking behavior.

User studies can demonstrate the disconnect between image indexing practices and user queries of image retrieval systems. Pu conducted quantitative studies of user-generated image queries in web search engines by categorizing the queries in the query logs of an image search engine according to their levels of uniqueness and refinement (2008). Query log analysis is a common technique in studying online information seeking that is also applicable to image seeking. By looking at the frequency and type of refined terms and modifiers present in failed queries, Pu's research suggests that users'

unsuccessful queries include more specific terms than do successful queries. The tendency of users to include very specific information when searching for images online can help inform librarians in instructing users to find images on the web and in digital collections, especially because many image seekers are looking for images that simultaneously fit several different specific criteria, including subject, geographic location, and time period (Choi & Rasmussen, 2003; Goodrum, 2005; Westman & Oittinen, 2006).

Looking at a variety of academic disciplines and subject-specific digital collections rather than the general web provides multiple perspectives on the types of images users are looking for and the vocabularies they use to seek images. Several different methods for studying users of digital image collections are employed including focus groups, interviews, query log analysis, and questionnaires. Choi and Rasmussen (2003) studied experts in American History (the authors define experts as professors and graduate students) as they used the Library of Congress' American Memory digital library to find images related to their research. The American Memory digital library aggregates content from the Library of Congress and repositories all over the country. Users can search through individual collections or across several collections, and while American Memory has interdisciplinary relevance, it is especially good for research in American history and culture. By analyzing users' queries according to these theories of image indexing, the authors found that geography and chronology terms were most frequently included in search strings because users were searching for images related to a specific historical context (Choi & Rasmussen 2003).

While Choi and Rasmussen (2003) studied a tightly defined user group interacting with a very large digital library, Matusiak (2006) instead evaluates the user experience of image seeking in a small, curated digital library called “Milwaukee Neighborhoods: Photos and Maps 1885 – 1992.” Participants in the study included community users, students, and researchers, so the data gathered reflects different trends among the different user groups. Across all groups, users employed two primary search techniques – browsing and keyword searching. The authors determined two conceptual frameworks to describe how users interacted with the collection: either as an exhibit, where images were discovered through browsing, or as a website, where images are discovered by keyword searching. This difference between browsing and keyword searching has implications for instructing users on the techniques that can be used when searching for relevant images in different types of collections. Understanding image browsing behavior is also important within the context of users’ cognitive needs when searching for images, especially because browsing through related images is an efficient way to compensate for the limitations of image indexing (Yoon, 2009). Most general web search engines allow users to browse after a textual query has been made, but web search engines may not link to other items catalogued with similar terms as a metadata record in a digital library would. Below are examples of browsing in different image search engines and digital collections.

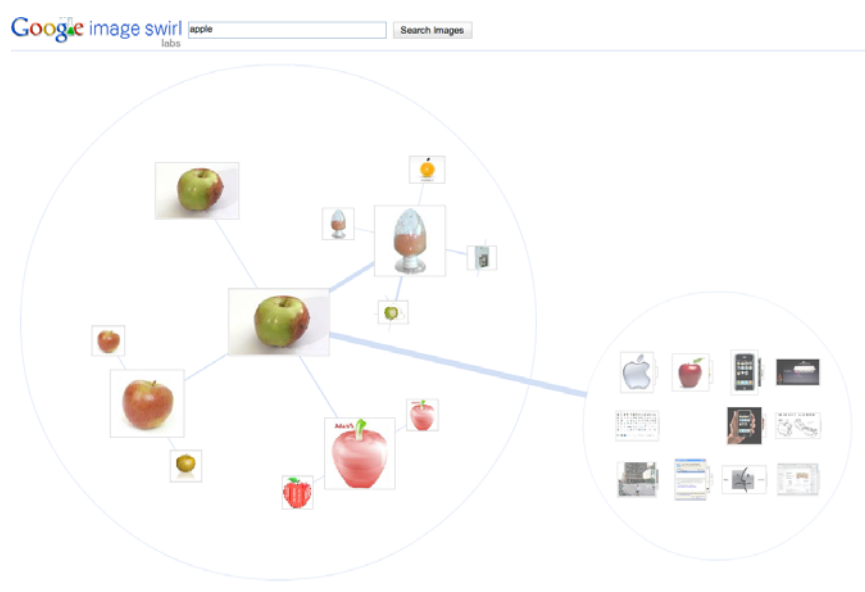


FIG 6. Screenshot of a Google Image Swirl results page for the search “apple.” The results page is intended to visually represent the relationship between images of apples but clustering groups of images that are similar in size, shape and color. (<http://image-swirl.googlelabs.com/>)

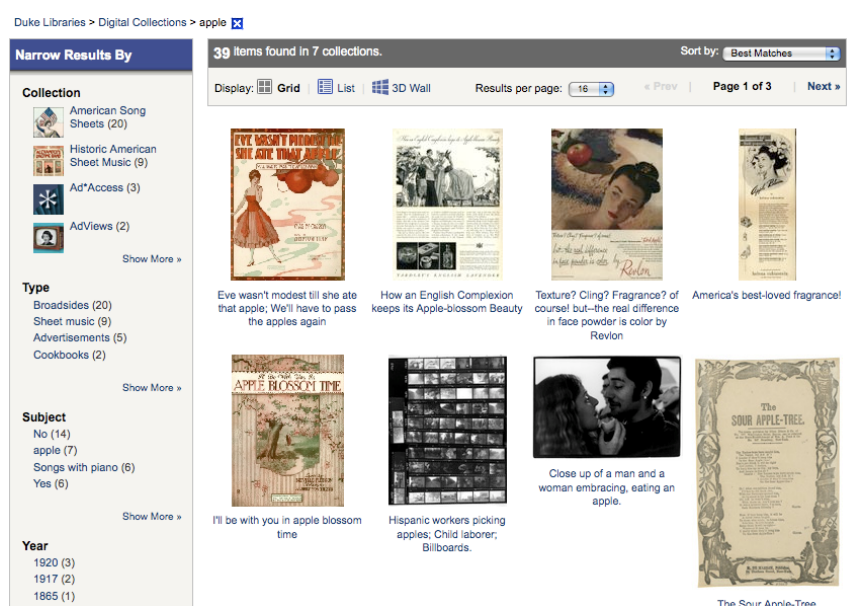


FIG 7. Screenshot of a browse-by results list for a search of “apple” in Duke Digital Collections. Faceted browse-by categories are visible at the left of the results screen, allowing users to refine their queries based items available in the collection. (<http://library.duke.edu/digitalcollections/>)



FIG 8. Screenshot of the Cooliris 3D Wall view of the results for a search on “restaurants” in the “North Carolina Postcards” digital collection at UNC Libraries. (http://www.lib.unc.edu/dc/nc_post/)

These products could be considered visual tools for browsing. Google’s new product, Google Image Swirl (Figure 6), presents search results clustered by their visual content, essentially combining content-based indexing and some elements of CBIR technology. Clustering image search results can increase the effectiveness of browsing because it allows users to select an image type they are interested in and explore more (Yoon, 2008). The faceted browse-by categories present in some digital libraries, including the Duke Digital Collections (Figure 7), let users refine their queries according to different aspects of the images, including geographic location and year. The Cooliris 3D Wall application (Figure 8) supports browsing of visual material by providing users with an interactive, virtual wall users can pan through to view many thumbnails of results at once.

While digital image collections can be used to supplement research in a variety of academic disciplines, they are also beginning to be integrated into course instruction as

well. This shift suggests the utility of digital image collections and their applicability to course design as an instructional technology. Usability studies that consider how the students and professors interact with the digital image collection in the context of a course are extremely beneficial to understanding how libraries can use digital libraries to support curriculum needs. In a study by Pan, Saylor, and Hembrooke, two different undergraduate courses included the same digital library as part of their course instruction and assignments (2006). The digital library used in these two courses was developed and hosted by the college's library. The courses were from two different disciplines, featured different groups of student users, and were taught with different pedagogical requirements and learning outcomes. Despite these differences, the digital library presented material relevant to both courses. The material in the digital library presented information in four different modules, and after evaluating the user experience at the end of the semester, the authors discovered that different modules appealed to students depending on which course they were enrolled in (Pan et al., 2006). This study suggests visual information should be expressed in different ways in order to meet different cognitive styles or different needs. As university libraries are often responsible for architecting and maintaining digital libraries, collaborating with faculty, and helping individual students, they make it a priority to have a platform and content that are applicable to different situations.

In addition to analyzing how users interact with digital image collections after they are established, academic institutions may try to define the needs of their community before implementing or designing image retrieval systems. Prior to developing an image delivery system for Pennsylvania State University, Pisciotta, Brisson, Ferrin, Dooris, and

Spink conducted a needs assessment of their users (2001). Their findings discuss ideas of inter-disciplinary digital collections, and the importance of providing several interfaces in order to meet the needs of as many different users as they can. Pisciotta et al. assert that if digital collections provide different interfaces and added-on tools and services that may be unfamiliar to users, librarians are a good candidate for suggesting relevant collections and tools to professors or individual researchers (2001).

In a more specialized context, Paling, Misekiewicz, Abbas and Zambon conducted a needs assessment of faculty and administrators in a dental school to determine what they would like to see in a proposed digital library of digitized dental images (2008). The professors and deans surveyed identified a variety of ways in which they would use the digital collection, including both classroom instruction and patient education. The ability to share images with students and colleagues at their institution as well as other institutions was seen as a great resource. The survey results revealed that value-added contextual information, including annotations and extensive metadata were preferred, but that the high cost of doing so may be a hindrance to the entire project. Even without intensive cataloging of individual images, the professors and deans thought that a collection with brief item records would still be useful.

The Role of Intermediaries in the Image Seeking Process

Several authors discuss the role of intermediaries in image seeking, typically within the context of archives or special libraries. The literature suggests that the image search process is more successful when users involve experts in their image seeking strategy. Westman and Oittinen conducted a study of the image seeking behavior of journalists that included the role of archivists who collaborated with journalists in a

variety of capacities (2006). The authors' study found that journalists have special image needs – often the “best” image is actually the most “useful” image (Westman & Oittinen, 2006). The notion that images present qualities that are subjective and interpretive complicates the image seeking process because relevancy is determined by a number of different selection criteria. The selection criteria used by journalists in Westman and Oittinen's study included information that is indexed as well as information that is not indexed (2006). Librarians and archivists serving as intermediaries can help users navigate through these criteria and evaluate images in fluid ways depending on the context. In Westman and Oittinen's study, individuals used their archivists at different points and for different purposes throughout their image seeking processes, which suggests that professionals who function in the role of mediators need to understand their user population and their user's need. A recent article by Neal addresses the future of image seeking in online news sources, highlighting the potential problem of searching for images, infographics, and multimedia that is generated or displayed on online news websites because it is currently not indexed or searchable (2009). In the future, intermediaries may be necessary to locate content that was previously available on the web but later buried deep within large news websites.

Experts, including librarians, visual resource curators, and other related professionals, can help mediate between users' image seeking needs and the systems that index the images. Goodrum suggests that there is a significant semantic gap between the representation of an image and the connotations of an image despite the development of controlled vocabularies, thesauri, and best practices (2005). Westman and Oittinen's study confirmed this semantic gap when it was revealed that often the criteria on which

users evaluate images is not something that is indexed. Images mean different things to different people, a problem that is compounded in interdisciplinary research, which is becoming increasingly more popular at academic institutions (Westman & Oittinen, 2006). Goodrum's study demonstrates that user reference requests for image research are typically longer and more descriptive than web queries because it takes longer for users to articulate their visual image needs to another individual (2005). The digital reference librarians in Goodrum's study answered email questions regarding images by using many of the same terms that users identified in their questions and by offering synonyms or explanations (2005). This process of parroting back and translating user requests for images attempts to bridge the semantic gap. Goodrum also looked at the overlap between user requests and the websites provided by librarians in the response emails (2005). The results of the study confirm that there is a significant gap between users' understanding of their image needs and the systems that index images, and that gap is frequently bridged by librarians or other professional intermediaries.

Visual Literacy Instruction

As intermediaries in the image seeking process, reference librarians need to be able to convey different techniques for finding, using, and citing images to their users. Rockenbach and Fabian identify several competencies of visual literacy, including the ability to observe visual images, the ability to determine the visual information need, and the ability to use appropriate hardware and software to meet the need (2008). In addition, the visually literate user will be able to evaluate images for authority, quality, and usability, and to apply or demonstrate their image-based knowledge (which the authors define as being able to present on the image using PowerPoint software, or to write and

cite the image in a research paper). The authors derive their definitions of visual literacy by interpreting relevant sections of ACRL's Information Literacy Standards as it pertains to visual images. For example, if ACRL's Information Literacy Standards espouse critical *thinking*, visual literacy standards would give preference to critical *viewing* (Rockenbach & Fabian, 2008). By extending the principles of text-based literacy to visual materials, the authors argue that visual literacy involves instructing users in several core competencies that empower users to find, evaluate, and use images that are relevant to their research. While the authors suggest that art history and other disciplines that primarily focus on visual studies have been requiring these skills of their students for some time, other similar expectations appear in the literature regarding other disciplines, including dental school (Paling et al., 2007), math and physics (Pan et al., 2006), and history (Matusiak, 2006).

Rockenbach and Fabian also provide a history of the term "visual literacy" and discuss how it relates to current trends in information literacy instruction (2008). The authors argue that because information literacy depends on the technology and mass media the culture embraces, being visually literate is a necessary response to living in an increasingly visual environment that has media in all formats, including images, video, architecture, and "infographics," which visually display information based on statistics, events, or otherwise model a concept. Snavely also supports the argument that contemporary society is increasingly steeped in visual images, and even uses the term "visual ecology" to describe the environmental surroundings of images (2005). After describing the features of visual literacy, Rockenbach and Fabian discuss how art librarianship can inform visual literacy education in general (2008). Visual literacy

education is relevant across all academic disciplines, and the authors argue that the skills afforded by art librarians to support art history curricula can be expanded to other disciplines (Rockenbach & Fabian, 2008).

As a discipline, art history scholars have been particularly active in the debates of visual image seeking and visual literacy education. An essay by Leader describes how changes in technology have impacted her teaching style and increased her success in conveying complex and abstract concepts by allowing her to display and manipulate digital images (2007). According to Leader, the affordances of digital images, including convenience and manipulability, are checked by issues of design and layout, two aspects of display that are dependant on professors' and librarians' skills as educators.

Instructional technologies have changed educational models, and digital collections of images enable students to move beyond the canon (2007). Art history instructors can also expand on the traditional method of showing two images side by side and show several images all at once, and to include images outside those traditionally popular or easily accessed.

In a recent survey of academic reference librarians, Mayer and Goldenstein demonstrate the extent to which librarians work with images in a variety of contexts (2009). The authors were curious to know how librarians engaged with image-related tasks, including collection development or the acquisition of image databases, instruction sessions on finding images, preferences for finding images, and librarians' perceptions of student and faculty demand for images. The results of their survey confirm that reference librarians work with a wide variety of image resources on a regular bases, and provide services to their users employing multiple strategies. These strategies include links to

free digital collections hosted by a single institution, subscribing to proprietary image databases, and providing instruction for finding and evaluating images. While the survey results revealed that librarians are, for the most part, meeting user demands for images, they results also suggest some concrete areas for improvement. For example, the results show that 36% of libraries do not provide links to free online image collections (Mayer & Goldenstein, 2009). Because academic libraries across the country are digitizing materials and making them freely available on the web, being aware of these resources is crucial to the digital collection's success.

Resources and Services for Image Research in Academic Libraries

There is a significant user-generated demand for images in academic institutions, as evidenced by the needs assessments discussed previously (Paling et al., 2007; Pisciotta et al., 2001). By extension, there is a demand for corresponding library instruction to support needs for images (Mayer & Goldenstein 2009). Evidence suggests that users need mediation and assistance using online image collections to successfully find and evaluate relevant images, for which they often have specific contextual, geographic, and chronological criteria (Goodrum 2005; Westman & Oittinen 2006). In academic libraries, reference and instruction librarians can meet this need through the emerging trend of visual literacy education. However, in order to fully help users, librarians themselves need to be aware of the full range of online image resources available to them, many of which are freely available while others require subscription.

Harris lists several strategies for locating images in an academic library, including subscription databases, online image search engines, and open access image collections (2007). Harris does not explicitly mention digital libraries or other image collections

produced by academic libraries, unless they are implied by the category of open access image collections (2007). This represents a shortcoming in academic reference services by not fully utilizing the digital collections developed by colleges, universities, museums, and other cultural heritage institutions across the world. However, this shortcoming is not related solely to digital image collections, as recent research that suggests academic libraries do not often include on the non-traditional electronic resources in library catalogs. Forster argues that while open-access, high-quality academic resources (including the *Perseus Digital Library* and the *William Blake Archive*, two image-rich resources) could be discovered through a search engine, they are not often found within academic libraries' online catalogs (2009). While it would be impossible for librarians to be familiar with the content and features of the plethora of digital library collections, Harris' failure to mention digital libraries as a resource suggests that reference librarians may not view digital libraries as reference tools, even though they meet many of the user demands for images that support academic research.

While Harris raises the issue that some users have image needs that are basic and well suited to reference and instruction, like citing images, some users have high-level reference questions about image research. Choi and Rasmussen observed that their users would find information about related textual resources helpful in conducting further research; and, if this information is not provided in the image resource, librarians can meet that need (2003). The literature suggests that reference librarians in academic libraries should be able to address how to evaluate, use, and cite images in addition to consulting about the research process.

Reference interviews for users seeking images can often take the form of “translating” a user’s cognitive image needs into the external descriptors used by the database (Goodrum, 2005). The expertise of librarians can thereby be used as a mediating force between the user’s needs and the digital collection environment, which often uses controlled vocabularies and indexing terms that may not be readily apparent to the user. By analyzing image-related questions from a digital reference archive, Goodrum found that email reference questions about images are significantly longer than the query strings used in the user search interface. This demonstrates that users are frequently able to describe what they *are* looking for in addition to what they *are not* looking for, but they are still unsure how best to proceed in their research.

As a service, digital image resources can be accessed remotely, and users do not have to be in the same physical location as the source material in order to view the metadata records. Goodrum argues there is a great opportunity to be inter-institutional and collaborative in developing image collection services, because both have holdings of visual resources but have historically been independent of each other (2003). Although libraries and museums have traditionally had different access policies and presentation goals for their images, the prevalence of displaying images in digital collections has blurred the boundaries between the two institutions (Goodrum, 2003). Goodrum does not discuss the relationship between the visual resources department of universities, often associated with art and art history departments and the library, but that too is another opportunity for collaboration in providing image reference services for users.

Methodology

This research study was conducted using a brief online survey. Surveys developed as a means of estimating the characteristics of a large population by studying a sample of the population in order to make generalizations. As a result, surveys can be successfully applied to research that includes a large population or a large geographic area. The ability to make generalizations from a survey depends on whether or not the survey sample is an accurate representation of the population. In many cases, the participants of the survey may be self-selecting, and therefore the survey results describe the surveyed population and may not necessarily be extensible to the general population. According to Hank, Jordan, and Wildemuth, surveys are useful for gathering data on “beliefs, opinions, attributes, and behaviors,” (2009, p. 256) Because this research study is interested in exploring the practices and opinions of reference librarians, surveys are a logical choice. Furthermore, surveys can contain different types of items and can gather different types of data and responses. For example, Likert scales are good for measuring attitudes and behaviors, and open-ended questions are good for getting responses that are not bound to the categories developed by the researcher.

This survey employs open- and closed- ended items in order to better understand the resources reference librarians use when helping users find digital images on the Web as well as their decision-making process and confidence level in handling reference interactions that involve images. The open- and closed-ended questions are intended to supplement each other. The open-ended questions borrow from the critical incident

interviewing technique in order to capture data about occurrences that Luo and Wildemuth describe as difficult to observe or do not happen frequently (2009). In this way, the open-ended allow for respondents to reflect on a reference interaction of their choice without having to directly observe a reference interaction.

The closed-ended items are primarily Likert-type scalar measurements that provide response categories intended to determine patterns and preferences for types of resources. These resources include Web search engines, locally maintained digital image collections, image collections maintained by other institutions, and inter-institutional or consortial resources. User studies of digital collections, needs assessments, and a study of image resources available at academic libraries present these online image collections as resources to aid in the image seeking process; by asking participants how often they use these resources during reference interactions, the research study should reveal something about librarians' preferences for particular types of resources.

While this study does not employ a true mixed methods approach to analyzing the research questions, it is inspired in part by other library and information science research that does. For example, in Kwon's recent study, "A Mixed Methods Investigation of the Relationship between Critical Thinking and Library Anxiety among Undergraduate Students in their Information Search Process," the author asked research participants to complete a survey and write a brief essay that reflects on a critical incident of using the library to complete an assignment or research project (2008). By comparing the quantitative results of the survey to the qualitative analysis of the essays, Kwon was able to find associations between variables that would not have been revealed using just one of the methods. By incorporating an open-ended question regarding a critical incident in the

survey, it is hoped that the qualitative analysis will supplement the results of the Likert-type survey questions as in Kwon's study.

A primary disadvantage for conducting research studies via online questionnaires is the potential for low response rate and incomplete surveys. In addition, the single, anonymous contact between researcher and study participant that precludes any follow-up or opportunity to draw out concepts or explanations. Given the scope of this research project, participants were not asked to participate in a follow-up survey or to expand on their responses. The decision to design a study that was not interactive had implications for the design and context of the research project, which intended to explore how academic reference librarians use online resources to help users find images. Two open-ended questions were designed with this disadvantage in mind.

The study is also limited in that it is only distributed to one listserv, which suggests that the respondents will be self-selecting to be interested in the research topic. The LIBREF-L listserv was selected because of its large subscription base and because it is not affiliated with a single discipline or professional organization. Identifying appropriate library listservs for multiple academic disciplines would reach expose the research study to a larger audience, but many organization listservs focus on multiple aspects of librarianship, including technical services, collection development, and management.

Population and Sampling

The targeted population for this research study is academic reference librarians in the United States. The LIBREF-L listserv, hosted by Kent University, is an email listserv of over 2,000 reference librarians. By distributing the online survey to a listserv of this

size, the survey will be exposed to a geographically diverse population of reference librarians.

Instrument Discussion

The survey (Appendix C) is organized into four topical areas: Reference and Digital Images, Digital Image Resources, Confidence Using Digital Image Resources, and Demographic Questions. The survey was developed using the Qualtrics software package, available from the Odum Institute at the University of North Carolina, Chapel Hill.

The survey opens with a screening question to ensure that all participants in the research study meet the criteria of working in an academic library, and the Qualtrics software allows for skip logic such that if they answer negatively to the screen question, they will be brought directly to the end of the survey showing the thank-you screen. The survey is designed such that the two open-ended questions appear immediately after the screening question. These open-ended questions are designed to probe into the exploratory component of the research question. Peterson recommends beginning the survey with an introductory section that engages the study participants and encourages them to continue (2000).

After the screening question, the study then moves into the qualitative response question, beginning with a question that asks participants to describe a recent reference experience. By first focusing the participants attention on a recent experience helping someone find digital images on the Web, the responses to the open-ended questions will be impacted by remembering the experience of a particular reference interaction. This question was designed with the interview technique of the “critical incident” in mind;

while Peterson recommends that the first questions be easy to answer, it is possible that this initial question is perceived as a lot of effort for the participant; however, the question is merely asking them to describe the event, not to make any intellectual or professional commentary about it (Luo & Wildemuth 2009; Peterson 2000). In addition, putting the open-ended questions at the beginning of the survey may encourage more responses because item non-response increases as the survey goes on.

The second question asks participants what they find difficult about helping users find digital images. Recalling a recent event will remind participants of what was difficult about helping the user find images or what shortcomings the resources presented. The responses gathered from this question should support or challenge the findings of user studies of digital image collections, and will help demonstrate how image collections are used as reference sources.

After the two open-ended questions, the participants will be asked a series of closed-ended questions regarding their habits and confidence level. The study closes with two demographic questions that ask the respondents to report on their primary job responsibilities and to categorize their institution.

A definition of the term ‘digital image’ is provided at the beginning of the study in order to provide a working definition for all survey participants. The definition used in this study is modeled after the definition used by Mayer and Goldenstein in their recent study on the image resources provided by academic libraries (2009). Their inclusion of a definition reinforces the notion that finding digital images online is difficult because it is a broad topic with many interpretations. The definition included in this study reads, “for the purpose of this study, we define a *digital image* as a still image found online, not a

moving picture or video. It can be a reproduction of a painting, a photograph, or an original work.” Including a definition in this survey means that all participants in the survey will have the same framework for interpreting the survey questions even if they are not experts in mediating image reference requests.

The instrument was pretested by two reference librarians who have answered questions about image research. Questionnaire items were reviewed for clarity and coherence, and special attention was given to the mechanics of the survey to ensure that respondents would be able to interact with the survey without incident.

The survey was distributed to Kent University’s LIBREF-L listserv via an initial email invitation to participate (Appendix A) and a follow-up email (Appendix B). After the results were gathered, quantitative data was analyzed using descriptive statistics and qualitative data was grouped and coded according to emerging themes in the responses.

Results

About the Respondents

Forty-eight completed surveys were collected, and of those, thirty-eight respondents indicated that they were employed in an academic library. Thirty-eight surveys were analyzed. All participants were asked to indicate their primary job responsibilities, and they were allowed to select multiple categories. All participants indicated that reference was one of their primary job duties and two-thirds of respondents listed instruction as a primary job duty (see FIG. 1). No respondents listed systems as a job responsibility, although one write-in response was for “webmaster.” Other job duties listed include resource sharing, liaison/subject librarian, government documents, and archives processing and research. The respondents list a variety of job responsibilities in addition to reference. Respondents were also asked to indicate the type of academic institution at which they are employed. As evidenced in FIG. 2, most respondents are employed at institutions where a doctorate is the highest degree granted.

FIG. 1. Primary Job Duties of Respondents

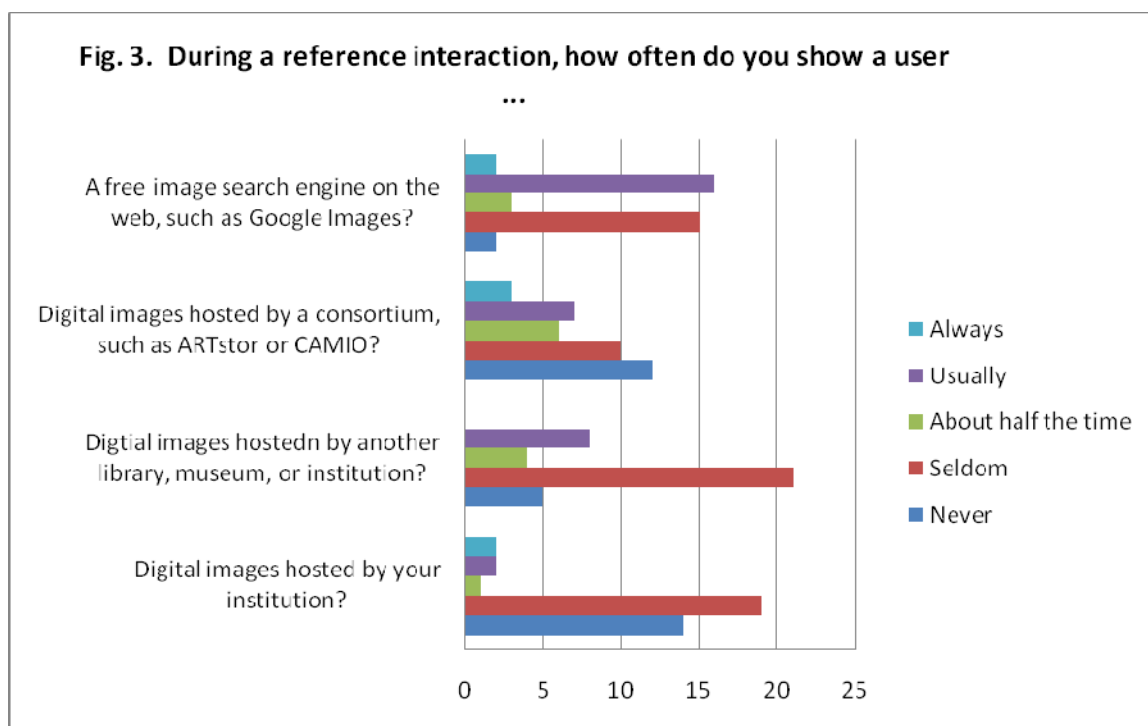
| | Responses | Percent of Total |
|------------------------|-----------|------------------|
| Reference | 38 | 100% |
| Instruction | 25 | 66% |
| Collection Development | 18 | 47% |
| Administration | 8 | 21% |
| Other | 7 | 18% |
| Acquisitions | 3 | 8% |
| Digitization | 3 | 8% |
| Cataloging | 2 | 5% |
| Systems | 0 | 0% |

FIG. 2. Highest Degrees Awarded at the Institutions where Respondents are Employed

| | Responses | Percent of Total |
|---------------------------------------|-----------|------------------|
| Doctorate is highest degree granted | 21 | 55% |
| Master's is highest degree granted | 10 | 26% |
| Bachelor's is highest degree granted | 6 | 16% |
| Associate's is highest degree granted | 1 | 3% |

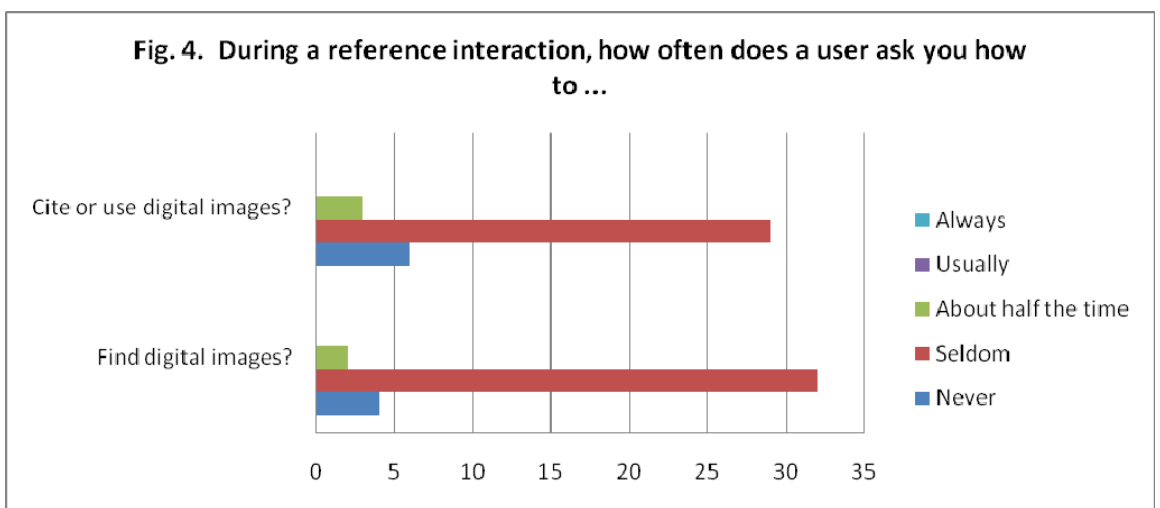
Frequency of Use of Digital Image Resources

Respondents were asked to indicate how frequently they refer users to different types of image resources available on the Web during a reference interaction. A five-point scale measured frequency, with respondents choosing between, “never, seldom, about half the time, usually, and always). The answers to this series of Likert-type questions can be seen in Figure 3.



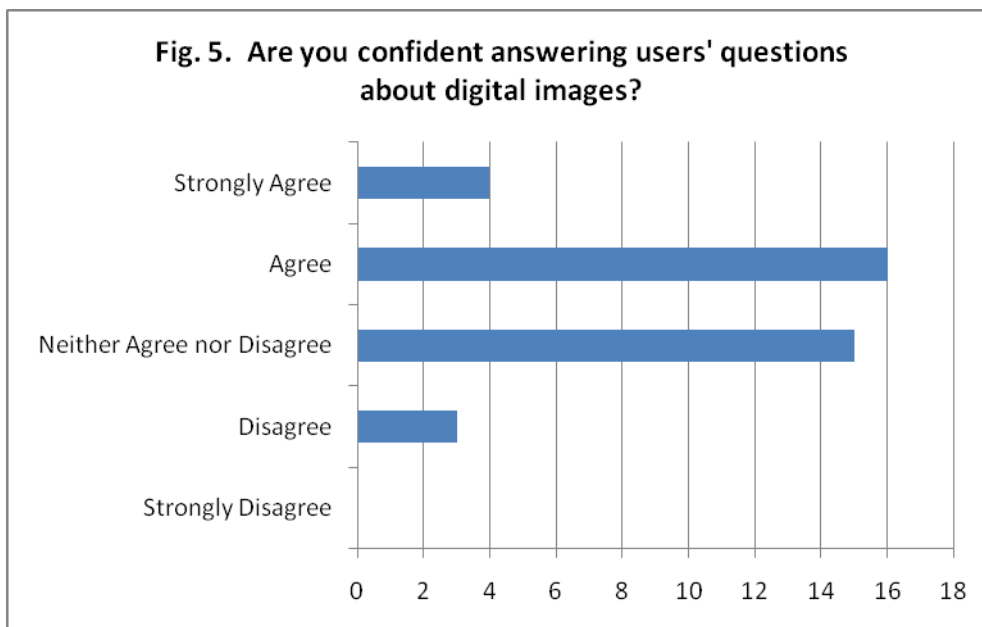
User Needs in the Reference Interaction

Respondents were asked to indicate how frequently users ask about finding and citing images. The same five-point scale was used for these two questions, and the respondents indicated the frequency along the scale, “never, seldom, about half the time, usually, and always.” The answers to this series of Lickert-type questions can be seen in Figures 4. The results of this question are not clearly defined, and there seems to be no significant difference between these two aspects of image reference.



Confidence of Reference Librarians

Respondents were asked to indicate if they felt confident answering users' questions about digital images. The majority of respondents selected "agree" and "neither disagree nor agree." The results to this question were averaged and can be seen in Figure 5.



Description of an Image Reference Interaction

In order to determine the spread of image reference questions across academic disciplines, the first question asked participants to identify the discipline of their reference interaction. The open-ended responses were categorized and coded, and the results are in the table below FIG. 6. Academic disciplines identified included, African American studies, architecture, art, art history, criminology, history, health sciences (ophthalmology and physical therapy), religion, social work, and theater. Maps and geographic information were also identified as specific resource types that users were

seeking. The chart below displays the disciplines represented in the reference interactions described by respondents. The majority of reference interactions described by respondents deal with the subjects in the humanities and the social sciences were most common. Queries related to health science fields were the least common, and no queries came from the hard sciences.

Fig. 6. Academic Subject Areas Identified in Open-Ended Responses

| | Discipline | Number of Times Mentioned | Percent of Total |
|------------------------|--------------------------|----------------------------------|-------------------------|
| Humanities | Architecture | 1 | |
| | Art and Art History | 10 | |
| | Theater | 3 | |
| | Religion | 1 | |
| | Total | 14 | 60.9% |
| Social Sciences | African American History | 1 | |
| | History | 3 | |
| | Social Work | 1 | |
| | Criminal Justice | 1 | |
| | Total | 6 | 26.1% |
| Health Sciences | Ophthalmology | 1 | |
| | Physical Therapy | 1 | |
| | Vision Science | 1 | |
| | Total | 3 | 13% |

Respondents were asked to indicate what online resources they used to address the image query. The responses were categorized by type of resource, and coded. The results are visible in the table below. Many responses mention a combined strategy of using both ARTstor and Google Images to satisfy the image need. By far, respondents mentioned Google Images and ARTstor as the primary resource they used to look for images. Both ARTstor and Google Images are large image collections; however, access

to these resources is different in that ARTstor is a subscription database and Google Images is freely available.

The Library of Congress' American Memory was the only freely available digital library listed by respondents more than once. One respondent replied that they had shown a user a digital collection hosted by the institution at which they were working. The response read, "the patron requested images of a small Kentucky town from a date range of 1900 to 1960. I used our institution's postcard to fulfill the patron's request."

The chart below (FIG. 7) demonstrates the type and frequency of resources used by librarians to answer the user queries in the reference interaction. The resources were grouped into categories including freely accessible websites with user-generated content, free Web search engines, free professionally maintained digital image collections, and subscription resources. At the category level, the most frequently mentioned category were subscription databases.

FIG. 7. Image Resources (Organized by Category) Mentioned in Open-Ended Responses

| Resource Category | Resource | No. of Times Mentioned | Percent of Total |
|--|--------------------------------------|------------------------|------------------|
| Freely Accessible User Generated Websites | Flickr | 1 | 2.6% |
| | Picasa | 1 | 2.6% |
| | Wikimedia | 1 | 2.6% |
| | Total | 3 | 6.9% |
| Free Web Search Engines | Google Images | 13 | 34.2% |
| | Total | 13 | 34.2% |
| Free Professionally Maintained Digital Collections | Library of Congress' American Memory | 3 | 7.9% |
| | Locally hosted collection | 1 | 2.6% |
| | Internet Public Library | 1 | 2.6% |
| | OAISTER | 1 | 2.6% |
| | Total | 6 | 13.9% |
| Subscription Resources | ARTstor | 12 | 31.6% |
| | AP Images | 3 | 3.7% |
| | CAMIO | 2 | 5.3% |
| | AtoZ Maps Online | 1 | 2.6% |
| | Academic Search Complete | 1 | 2.6% |
| | Oxford Art Online | 1 | 2.6% |
| | Saskia Art Images | 1 | 2.6% |
| | Total | 21 | 48.8% |

The use of technology was discussed in two responses. One mentioned having to help a user resize an image so that it could be included in a PowerPoint presentation, while another response discussed having scanners available in the library for users to make reproductions of images they find in books.

Identification of the Difficulties of Image Reference

Respondents were asked to identify what they felt were the difficulties in helping users find digital images. The open-ended responses were categorized and coded, and the results can be seen in the table below (FIG. 8)

| Perceived Difficulty | No. of Times Mentioned | Percent of Total |
|--------------------------------|-------------------------------|-------------------------|
| Limitations of metadata | 20 | 24.6% |
| Copyright and reuse | 9 | 21.4% |
| Selecting appropriate resource | 6 | 14.3% |
| Image size and resolution | 4 | 9.5% |
| Determining authenticity | 1 | 2.3% |
| Image editing software | 1 | 2.3% |
| Avoiding pornographic material | 1 | 2.3% |
| Total responses | 42 | |

The most frequent response to this question was a variation on the theme of translating the user's query into good search terms. Excerpts from the responses that touched on this theme include:

- “we search with words, which depending on the image, may not be adequate to find the image,”
- “subject headings are not sufficient to describe the complexity of images,”
- “interpreting the patron's question - it can be tough to take their question and turn it into a realistic search strategy,”
- “when searching either databases such as ArtStor or indexed images through Google, we are relying on keywords based on what we see as the subject of the painting. When looking for a picture of some chicks in in basket, is it chicks, chichkens, fowl, birds, or what? Although somewhat similar to the challenges of text searching, the artist or photographer doesn't give us any introduction keywords or abstract to pull keywords from.”

In addition to being aware of the limitations of metadata description in professionally maintained digital collections, other responses point out how the inconsistencies of user generated tags on the Web can complicate the process of conducting good search terms

when the metadata may be incorrect.

A more specific aspect of determining good search terms that the responses revealed was the idea of searching for an image that had multiple features the user was looking for, or that came from a specific chronological period. Some examples include:

- “If a patron just has one or two requirements (e.g., a picture of the sun), then it is quite easy to find a digital image. If, however, the patron wants an image with a number of features (e.g., a 1940s picture of a woman wearing a dress), it can be extremely difficult. It can also be difficult to find high resolution pictures that have a creative commons license authorizing reuse.”
- “Student looking for a picture of a 1930s era phone booth for a theater/scene assignment Tried AP Images, Google images, American Memory, tons of other websites.”

Other Comments

Respondents were given the opportunity to make additional comments about helping users find digital images. Thirteen respondents replied. One response suggested using the Google Books project as a means of “discovering which books have desired images,” as an alternative search strategy, and another respondent suggested the Websites Flickr and *stock.xchng* as resources for free images. Three respondents identified copyright, citation, and free access as areas of concern concerns, and five respondents indicated that they did not frequently field image reference questions. One response listed the importance of having scanners available for public use.

Discussion

Implications

Although no formal visual literacy standards exist currently, reference librarians often address several aspects of visual literacy during reference interviews, including introducing users to image research strategies and resources and discussing how to use and cite images. From the responses gathered, librarians are concerned about making sure users are aware of copyright and properly citing images. Determining the authenticity of the source and the image itself is a difficult skill to develop, and the survey results suggest that improper tagging and misleading descriptions can lead to finding “false positives” that meet the search criteria but do not satisfy the user’s need. The skills for evaluating an image’s authenticity might be taught by explaining how to tell if a website is reputable, discussing image quality, and noting whether or not there is any associated descriptive metadata and copyright information accompanying the image.

Perhaps the most important visual literacy skill librarians can teach users is in developing a good search strategy for digital images. The majority of responses reveal the difficulties in accessing images based on professionally created descriptive metadata and user-generated tags. Twenty respondents listed the limitations of metadata and keywords as a hindrance to discovering relevant images. Because librarians are aware of the limitations of image indexing practices and digital image collections, they can suggest strategies and resources to help find images that satisfy the user’s query. However, six respondents indicated that the prevalence of images on the web makes selecting the

appropriate collection or search engine difficult. Furthermore, developing a good search strategy is often dependent on the specific image collection because of the nuanced ways certain types of images are cataloged. For example, photo-sharing websites may utilize tags that describe images in ways that are drastically different than the subject terms applied in professionally maintained collections.

In addition to helping users find images in various collections and search engines, librarians also have to discuss use of images with their users. There are three aspects of “use” of digital images within the colleges and universities, namely rights, citation and presentation. Users may ask librarians to help them discover images that are available online for fair use or not under copyright, how to properly cite images within various citation styles, or how to resize or manipulate the image for display in presentation software or for inclusion in research papers. Because this has been identified as a user need, librarians themselves need to be proficient in using image software such as Adobe Photoshop as well as software for word processing and software. By having a working knowledge of these applications, librarians would be better able to support student needs in academic libraries.

The responses suggest that reference librarians rely on (and perhaps prefer using) large image collections such as ARTstor or specialized image search engines like Google Images. These resources present a large amount of image content that is applicable to a variety of academic disciplines. However, the similarities between ARTstor and Google Images are few. ARTstor is a subscription database that ingests images and metadata records from a variety of institutions while Google Images indexes user-generated HTML tags

One concern is that the responses suggest that reference librarians do not use digital image collections created and hosted by their own institutions as image reference resources. Only one response mentioned using a locally hosted digital image collection to answer a user's request, and because so much digital content is being produced and put on the web by colleges and universities, it seems that these resources would be good image reference resources, especially considering how often user studies are conducted and published about digital image collections. Given that many locally hosted digital libraries have a specific scope in nature, it may be that more encompassing resources such as ARTstor or Google Images are given preference, even if they may not be the most topically relevant resource for the reference query. It is not clear why reference librarians do not frequently use locally hosted image collections, but it is possible that users are not being introduced to valuable resources that may focus specifically on the topic of their research. In addition, many digital image collections maintained by academic libraries are freely available online, which could be an advantage over expensive subscription databases.

Furthermore, none of the responses to open-ended questions indicated use of alternative digital image resources such as CBIR search engines or value-added applications including Cooliris or Google Image Swirl. Certain query types may be well served by resources such as these, especially when users are looking for images that are similar to something they are already viewed.

Limitations of Study

The results of this study are limited because of the small sample size of the survey. Although respondents discussed reference interactions involving a wide variety

of academic disciplines in the open-ended questions, a study that tried to intensely compare the image reference interactions from different disciplines or focused on subject liaison librarians could potentially provide more conclusive data on preferred image resources.

In addition, the study was not interactive, and the researcher did not follow up with respondents to draw out further explanation for their responses. Similarly, the nature of the online survey meant that respondents do not interact with each other. The quantitative questions did not indicate any major difference in how librarians use or perceive different types of online image resources. A longer battery of survey items that focused on specific categories of digital image resources may have resulted in more concrete data.

Future Research

Several research studies suggest a relationship between curriculum and image resources, and several responses to the open-ended questions suggest that librarians notice when course assignments require image research. Future research that examines faculty knowledge of image resource, how they construct assignments, and what image resources they demonstrate during class could inform librarians on the preferred resources for certain disciplines as well as demonstrate the expectations of the faculty and students librarians are serving. This research could seek to determine how faculty learn of digital image resources, the extent to which faculty participate in developing image resources, and whether or not they emphasize visual images in their lectures or assignments.

Different methodologies may reveal more about the relationship between reference librarians and digital image resources. Observations of reference interactions or focus groups of reference librarians could provide more information on how librarians mediate the image seeking process on the web. And content analysis of the recommended resources on university library web pages and course guides could reveal preferred tools or gaps in librarians' knowledge of image seeking processes. Comparing different disciplines to art librarians could also reveal interesting information about common image reference practices because visual literacy and image seeking strategies appears frequently in the literature concerning art librarians.

A related area of research could focus on the growth of fields that are rapidly producing digital images that are not indexed or controlled for future use. Examples of this include medical and dental imaging, data visualizations, architectural models, among others. These resources can aid in teaching, research, and the dissemination of knowledge to patients, consumers, or clients. However, these images are not currently being managed in library-maintained digital collections. Content produced by online news sources including photographs, infographics, and multimedia projects are also not currently indexed. These untapped resources could prove to be an interesting area of research to address issues of digital preservation and discoverability. This argument could be extended to increase the degree that libraries and librarians are involved in the development and use of institutional repositories.

Future research that looks beyond academic institutions to study populations of corporate, special, school, and public librarians may reveal other patterns or references regarding image resources.

Conclusion

The lack of information documenting how academic librarians assist users during reference interactions that involve images prompted this research study. The literature on image retrieval and user studies of image collections suggests that librarians can effectively mediate user needs in the image seeking process, but the current literature on reference services in academic libraries does not exhaustively discuss the use of digital image collections. The online survey used in this research study was designed to explore how reference librarians respond to image reference questions and to try to determine which web resources librarians use most.

The survey's open-ended questions produced rich narratives that suggest that images are being used in a wide variety of academic disciplines, including the humanities, social sciences, and health sciences. Respondents indicated that they use several different types of digital image resources, including image search engines, proprietary databases, user-generated photo sharing websites, and professionally maintained digital libraries. However, the respondents frequently mentioned that the way images are described in online collections can often make it difficult to conduct queries that will satisfy users who are seeking images that will fit multiple criteria.

Most respondents indicated a heavy use of Google Images and ARTstor. Despite the wide scope and variety of image resources available to librarians, applications such as Cooliris and Google ImageSwirl, which provide unique value-added services were not mentioned. Furthermore, digital library collections maintained by academic libraries,

museums, and other institutions were mentioned infrequently. The applications encourage browsing and discovery for users, and the digital libraries provide a wealth of collection-specific metadata. This study suggests that librarians are either not aware of these resources or choosing not to demonstrate them to users. In either case, the literature on how users interact with digital image collections suggests that digital libraries and image search applications could be a productive resource in reference interactions or course instruction.

Visual literacy can address the difficulties in the image search process, and the responses to the survey's open-ended questions suggests that librarians are engaging in elements of visual literacy education despite that there are no formal standards. Visual literacy encompasses a wide array of skills, including defining the image need, determining image authenticity, citing images, and using images in word processing and presentation software programs. By including elements of visual literacy in reference and instruction in academic libraries, students across all disciplines may be more prepared to use images in their research.

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Appendix A – Email Invitation

Subject line: Please Participate in a Research Study on Reference Librarians and Images

My name is Bridget Madden and I am a Master's student in the School of Library and Information Science at UNC-Chapel Hill. I'm conducting a study to find out about the online tools and resources academic reference librarians use to answer questions about images.

I'd like to know how academic librarians support the image needs of users' in a variety of disciplines, so if you are interested in participating in the survey, please follow the link below. You do not need to have a lot of experience in helping users find images – in fact, I am looking for reference librarians who are not experts in the area.

I expect it will take you 10 minutes to complete the survey. There are some open-ended questions, followed by a series of closed-ended questions and brief demographic questions about your primary job duties. Participation in the research study is voluntary and you do not have to answer any question you do not wish to answer.

Your responses will be used to help better understand the relationship between image resources on the Web and the role they play in answering reference questions about finding images. The results of the research study will be used to write a Master's thesis in partial fulfillment of the M.S. in L.S. degree at UNC-Chapel Hill.

This research study has been approved by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill, IRB Study #10-0224.

Link to the survey:

http://uncodum.qualtrics.com/SE?SID=SV_0e1XN6IxoAwzO8k&SVID=Prod

Thank you,

Bridget Madden
bmadden@email.unc.edu
MSLS Candidate 2010
UNC-Chapel Hill

Appendix B – Follow-up Email

Subject Line: Second Call for Participants in a Study on Reference Librarians and Images

Thanks to those of you that have already participated in this research study of reference librarians and digital images.

If you have not yet participated, please consider taking the online survey. I expect it will take you 10 minutes to complete the survey, and your responses will be used to help better understand the relationship between image resources on the Web and the role they play in answering reference questions about images.

This research study has been approved by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill, IRB Study #10-0224.

Link to the survey:

http://uncodum.qualtrics.com/SE?SID=SV_0e1XN6IxoAwzO8k&SVID=Prod

Thank you,

Bridget Madden
bmadden@email.unc.edu
MSLS Candidate 2010
UNC-Chapel Hill

Appendix C – Survey Instrument

Consent

Please read the consent form and then indicate your agreement by checking the box below it.

University of North Carolina-Chapel Hill
Consent to Participate in a Research Study
Adult Participants
Social Behavioral Form

IRB Study #10-0224
Consent Form Version Date: 2/8/2010

Title of Study: Online Visual Image Resources and Reference Services in Academic Libraries

Principal Investigator: Bridget Madden
UNC-Chapel Hill Department: School of Information and Library Science
UNC-Chapel Hill Phone number: (919) 962-8366
Email Address: bmadden@email.unc.edu
Faculty Advisor: Jeffrey Pomerantz, pomcrantz@unc.edu

Study Contact telephone number: (773) 841-6778
Study Contact email: bmadden@email.unc.edu

What are some general things you should know about research studies?
You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

I agree to participate.

Screening Question

Do you work in a college or university library?

- Yes
- No

Reference and Digital Images

Digital image: for the purpose of this study, we define a digital image as a still image found online, not a moving picture or video. It can be a reproduction of a painting, a photograph, or an original work.

Please describe the most recent time you helped a user with a question about digital images. What discipline or subject area was the question from? What steps did you take to answer the question? What online tools did you use to help answer the question?

In your opinion, what are the difficulties in helping users find digital images?

Digital Image Resources and Use

During a reference interaction, how often do you show a user ...

| | Never | Seldom | About half the time | Usually | Always |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Digital images hosted by your institution? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Digital images hosted by another library, museum, or institution? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Digital images hosted by a consortium, such as ARTstor or CAMIO?

A free image search engine on the Web, such as Google Images?

During a reference interaction, how often does a user ask you how to ...

| | Never | Seldom | About half the time | Usually | Always |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Find digital images? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cite or use digital images? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Do you have any other comments about helping users find digital images?

Confidence Using Digital Image Resources

| | Strongly Disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|--|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|
| How confident do you feel answering users' questions about digital images? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Demographic Questions

My primary job duties include the following: Please check all that apply.

Acquisitions

- Administration
- Cataloging
- Collection development
- Digitization
- Instruction
- Reference
- Systems
- Other, please describe:

Which best describes your institution?

- Associates is highest degree granted
- Bachelor's is highest degree granted
- Master's is highest degree granted
- Doctorate is highest degree granted

Thank You and More Information

Your response has not yet been recorded! Please click the arrow below to submit the survey.

Thank you for your time in completing this survey. The results will be used in a Master's Paper that partially fulfills the requirements for the Master of Science in Library Science at the University of North Carolina, Chapel Hill.

For more information, please visit the link below. The link will open as a Word Document containing information submitted to UNC Chapel Hill's Institutional Review Board.

http://www.unc.edu/~bmadden/info_imagesandreferencesurvey.doc