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Understanding Ultimate Use Data and its Implication for Digital Library Management: A Case Study

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Understanding Ultimate Use Data and its Implication for Digital Library Management: A Case Study

MICHELE REILLY and Santi Thompson

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Michele Reilly and Santi Thompson
Understanding Ultimate Use Data and its Implication for Digital Library Management: A Case Study

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Information professionals and librarians have been studying, discussing, and developing digital libraries for over two decades, but understanding ultimate use of images from digital libraries remains a mystery for many of them. Most articles written on digital library use focus on users’ search retrieval needs and behavior. Few mention how digital library patrons use the images they request. Like many digital libraries, archives, and special collections, the University of Houston Digital Library makes high resolution images available to their patrons. Image delivery is achieved by an automated system, titled the Digital Cart Service. An unexpected benefit of the Digital Cart Service is the reporting mechanism that produces data that includes intended use information. This article discusses the analysis of this data to determine why images were used, what products were created from the images, and what implications this has on digital library management. The authors believe that answering these questions creates an environment in which digital library innovators can better promote and design digital libraries, and describe and select the content in them.

KEYWORDS digital libraries, digital library users, digital images, user requests, user study, outreach, data collection, selection for
INTRODUCTION

With the click of a mouse, today’s users have more images at their disposal than ever before. According to researchers Lori McCay-Peet and Elaine Toms, “The plethora of readily available images led Jorgensen (2003) to suggest that we have returned to an era when images dominated human communication that formerly was grounded in visual representations rather than text” (2009, 2416). However, understanding how these images are ultimately used remains largely unexplored in the professional literature.

The University of Houston Digital Library (UHDL) is a freely accessible, online repository containing objects from the University of Houston Libraries and other university departments. Established in September 2009 and built on the CONTENTdm platform, the UHDL is a Web-based library of approximately 50 collections holding almost 50,000 images, documents, sound recordings, and moving images of cultural, historical, and research significance. The UHDL was created to be used by academics and researchers at UH and around the world. The mission statement asserts, “The University of Houston Digital Library is a comprehensive digital library, which provides for our students, faculty, and the greater community a rich and exciting environment for the discovery of digital resources and knowledge” (University of Houston Libraries 2013).

For the context of this article, the authors define a digital library in general terms as any digital repository that includes multiple formats, provides associated metadata and other descriptive information, and is open and accessible to the public. In recent literature, these repositories have been defined as “general” and/or “web image collections” (Chung and Yoon 2011, 163). Most of these materials will be in the form of images, PDF documents, maps, and audio/video files. They often contain digital surrogates of rare or unique special collection materials. The authors believe that these image repositories are not primarily considered institutional repositories, which typically make accessible the scholarly pursuits of a university’s faculty and students (e.g., scholarly articles, electronic theses and dissertations, and data sets). Some examples of popular digital libraries include the Library of Congress’s American Memory, the New York Public Digital Gallery, and the Smithsonian’s Digital Library.

Many digital libraries, archives, and special collections make high resolution images available to their patrons. Although some services are fee-based, UHDL delivers high resolution images for free upon request. To facilitate this service, the UH library’s Digital Services department worked with the library’s Web Services department to create an innovative digital request...
system. Known as the Digital Cart Service (DCS), this automated system allows users to request 600 dots per inch (dpi) jpeg images to be delivered via e-mail. The patrons have 90 days to retrieve their requests and can download the images as often as they want within that 90-day period. Providing high resolution images for free in an automated system was intended to increase use by patrons and reduce the overall work for UHDL staff.

The DCS is designed to record patron-provided data, including name, date, image file name, affiliation, and the description of use. An unanticipated benefit of the DCS was the accumulation of “ultimate use” data. For the context of this article, the authors define “ultimate use” as the purpose for which users are requesting high resolution images. Since the system was developed in 2011, approximately 917 high resolution images have been requested and delivered to patrons. Relying on the responses from users of the DCS from 2011–13, this article will analyze the ultimate use of items requested from DCS. To do this, the authors asked the following questions:

• How are UHDL images ultimately used?
• What products are being produced using these images?
• What implications do these ultimate uses have on other facets of digital library management?

Investigating the above questions yielded insight into other important facets of administering a digital library, such as metadata creation, system design, marketing and promotion, and content selection.

The authors’ analysis focuses on why users downloaded the objects they did. Image seeking behavior, search retrieval, and other aspects of user behavior are not discussed except to make comparisons to other research or to discuss how the user behavior directly affects ultimate use results. As McCay-Peet and Toms stated, “Because the focus of image retrieval research has been on how people search for and describe images and the creation of tools for the retrieval of images, we know little about what people use images for” (2009, 2417).

LITERATURE REVIEW

Information professionals and librarians have been studying, discussing, and developing digital libraries for over two decades. Despite these conversations, the topic of understanding digital library ultimate use has rarely been addressed, especially in the professional literature. Most articles written on digital library use focus on users’ search retrieval needs and behavior. Few mention how digital library patrons are using the images they request.
Regarding the lack of research and literature on the uses of digital images, the authors of this article agree with Dr. Joan E. Beaudoin:

The ultimate use of images once they have been retrieved is another research area that is nearly without mention in the literature. While there have been many successful forays into discerning the phenomena surrounding image retrieval, the discipline has failed to address image users’ needs and how images are being used. This lack of understanding surrounding images has continued to make finding and using images some of the most challenging information experiences for users. (2009, 68–9)

Gradually, this gap in research is being addressed. Some of the earliest mentions of digital library use originated with studies focused on the behaviors of users, how they interacted with user interfaces, and their satisfaction levels. In a 2002 study, Joan Cherry and Wendy Duff observed the following:

The comments from the survey also revealed some unanticipated uses of the ECO collection, e.g., a toponymist uses ECO to pinpoint the date and origin of place names; one person uses ECO to help learn his native language; and another uses ECO as a source of knitting and crocheting patterns. These users may be some of the people who have been introduced to Early Canadiana through the WWW. (para. 40)

While Cherry and Duff were able to identify some uses of digital library content, more in-depth investigations were needed. McCay-Peet and Toms (2009) addressed the role of ultimate use in digital library management. Recognizing that ultimate use is “inadequately researched in information science,” the authors administered a survey to historians and journalists addressing this research gap (2009, 2427). Their study asked how their key audience used two-dimensional images “as objects to illustrate a written work or as data to inform the writing process” (2009, 2416). To formulate answers to this question, McCay-Peet and Toms interviewed 30 historians and journalists to understand how they were using images (for information or for illustration) and how they determined what images were appropriate for their work (2009). The authors discovered that both in general practice and in specific use, historians and journalists ultimately used images for illustrations rather than for information (2009). To benefit future ultimate uses, the authors suggested that information professionals develop more categories of access points to aid in image retrieval (2009). Specifically, McCay-Peet and Toms noted that “conceptual” attributes were often queried by users (2009, 2427). Often, these conceptual terms were not available in the metadata; however, users were able to adapt descriptive attributes such as “visual quality” to fit their needs (2009, 2427). They encouraged librarians to describe objects using both the conceptual and non-conceptual attributes
to aid the user (2009, 2427). Their work yielded important insights into how
historians and journalists ultimately used images in their work.
Other investigations have also focused on use among specific academic
disciplines. Valerie Harris and Peter Hepburn (2013) analyzed the use of
images by academic historians. They aimed to identify images derived from
a digital library and used within scholarly historical articles. They hypoth-
esized that more recently published history journal articles would include
images because the availability of images has increased with the rise of dig-
ital libraries. After reviewing journal articles from the last decade, Harris and
Hepburn speculated that “historians are not finding images suitable to their
research” (278). While the work of McCay-Peet and Toms and Hepburn and
Harris show the needs of specific users (historians and journalists), future
research could broaden this study by investigating ultimate image use in a
more general audience domain.
In their 2011 article, EunKyung Chung and JungWon Yoon grappled
with the topic of ultimate use among a larger pool of users. Using patron
search requests from the Yahoo! Answers.com portal as a case study, Chung
and Yoon created a mechanism to investigate ultimate uses of images. They
focused their analysis on data that asked 464 “image-seeking questions.” Us-
ing this data, Chung and Yoon developed a coding scheme for image use
(based on seven discernible classes of images created by Conniss, Ashford,
and Graham) and a coding scheme for image attributes (2011, 167–8). They
found that a majority of image uses fell into two categories: illustrative uses
and generation of idea uses. This discovery indicated that “users primarily
seek images that will be used for illustrating particular ideas with appropriate
images and for provoking thought patterns or inspirational ideas” (2011, 169).
Chung and Yoon concluded that information professionals should relate uses
to image indexing and build better interfaces informed by the ultimate use of
images (2011). While Chung and Yoon addressed the complexities of under-
standing ultimate use, practical examples of how this project relates to other
cultural heritage institutions is sparse. The present investigation will begin
to address some of these issues with more detail and make comparisons to
their work.
Perhaps the most in-depth investigation of digital library ultimate uses
to date is Beaudoin’s 2014 article on establishing a framework for under-
standing image use among archaeologists, architects, art historians, and
artists. She cited how difficult it is to account for ultimate use when man-
aging digital libraries because very few studies have documented “how and
why visual information is used” (Beaudoin 2014, 119). To overcome this
challenge, Beaudoin interviewed 20 professionals from the previously men-
tioned occupations to understand the “behaviors of individuals whose work
depends on images” (2014, 126). Specifically, Beaudoin asked three key
questions:
Her findings showed that a majority of uses pertained to the “development of knowledge” (2014, 131). Some other important uses included “developing creative works,” “critical thinking development,” “translating verbal information,” “engaging students,” “creating emotion,” and “marketing” (2014, 131). Many of the respondents used images in their work, particularly in lecture presentations, scholarly publications, architectural renderings, and marketing materials (2014). Beaudoin’s framework proved to be highly adaptable for the present research study. Specifically, her central questions closely mirrored the questions and hypotheses the authors were formulating. Drawing on data from the UHDL DCS, this study builds upon Beaudoin’s work by expanding the user base to include general visitors, scholars, researchers, students, and university staff. It also compares the ultimate use categories with those suggested by Chung and Yoon.

METHODS

The data in this study were obtained through the DCS “download statistics” feature. When a patron requests an image, the system logs their responses into an easily readable spreadsheet. Information collected includes name, e-mail address, affiliation, intended use, description of project, date, time stamp, the name of digital library collection accessed, and the digital image title downloaded by the patron. However, name, e-mail, date, and time stamp were deleted to protect the individuals’ identity. Thus, three fields for analysis remained: affiliation, intended use, and description. If personal information was left within the description field, that information was removed as part of the coding process. This spreadsheet was imported to an Access database for final analysis, which included analyzing the text of the description field, running queries to discover duplicates, determining the exact number of users and intended uses, and sorting the data. Tests performed by UHDL staff members for internal purposes were also removed.

From the descriptions given by patrons, a series of terms or codes were developed (Table 1). These codes were then normalized by the researchers to ensure accuracy and a shared understanding of the code terms. Any responses that did not meet the existing criteria were placed in the category “other.”

After compiling and analyzing all data, the authors recognized several limitations to this study. First, the study sample may not be representative of UH’s user population. For example, the authors do not know the users’ levels of education, their interest in cultural materials, or their visual literacy.
Ultimate Use Data

<table>
<thead>
<tr>
<th>Code</th>
<th>Purpose indicated by the user’s response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artwork</td>
<td>Decorative purposes</td>
</tr>
<tr>
<td>Publication</td>
<td>Print material (e.g., journal article, monograph, magazine article, thesis,</td>
</tr>
<tr>
<td></td>
<td>or dissertation)</td>
</tr>
<tr>
<td>Genealogy</td>
<td>Genealogical or family history purposes</td>
</tr>
<tr>
<td>Video</td>
<td>Video creation purposes</td>
</tr>
<tr>
<td>Promotional</td>
<td>Promotional, marketing, or display materials in any format (e.g., Web</td>
</tr>
<tr>
<td></td>
<td>site, poster)</td>
</tr>
<tr>
<td>Presentation</td>
<td>Presentation to a professional or general audience</td>
</tr>
<tr>
<td>Exhibit</td>
<td>Exhibiting materials or expanding the understanding of other materials</td>
</tr>
<tr>
<td></td>
<td>within an exhibit</td>
</tr>
<tr>
<td>Gift</td>
<td>A personal reward or present</td>
</tr>
<tr>
<td>Industry</td>
<td>Internal archives or use by a corporate entity</td>
</tr>
<tr>
<td>Instruction</td>
<td>Instructional purposes within a classroom or educational setting</td>
</tr>
<tr>
<td>Research</td>
<td>Any academic or personal research purposes</td>
</tr>
<tr>
<td>Other</td>
<td>Any responses that did not fit in any of the above categories or use was</td>
</tr>
<tr>
<td></td>
<td>not immediately apparent, including blank responses</td>
</tr>
</tbody>
</table>

Also, the ultimate use of UHDL images by users may not be the same at other cultural heritage institutions with digital libraries. Furthermore, the data from this case study were qualitative in nature, and the authors relied on the users’ descriptions of their projects to determine ultimate use. UHDL users have multiple ways to acquire images for ultimate use; therefore, data from the DCS may not be representative of all ultimate uses. Finally, as the DCS went through multiple upgrades, the options within the drop-down menu were added, changed, or deleted, thereby making some of the earlier data not as refined as later data.

RESULTS

In the “Affiliation” field, the user has the choice of selecting one of five options presented in a drop-down menu: Visitor, Staff, Student, Alumni, or Faculty. Results are shown in Table 2. Visitors were the largest group of users requesting images, at approximately 62 percent. The second largest group

<table>
<thead>
<tr>
<th>Type of user</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitor</td>
<td>594</td>
<td>64.8%</td>
</tr>
<tr>
<td>Staff</td>
<td>130</td>
<td>14.2%</td>
</tr>
<tr>
<td>Alumni</td>
<td>71</td>
<td>7.7%</td>
</tr>
<tr>
<td>Student</td>
<td>83</td>
<td>9.1%</td>
</tr>
<tr>
<td>Faculty</td>
<td>39</td>
<td>4.3%</td>
</tr>
<tr>
<td>Total</td>
<td>917</td>
<td>100%</td>
</tr>
</tbody>
</table>
TABLE 3 Intended Uses

<table>
<thead>
<tr>
<th>Intended uses</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>326</td>
<td>35.6%</td>
</tr>
<tr>
<td>Other</td>
<td>315</td>
<td>34.4%</td>
</tr>
<tr>
<td>Scholarly article</td>
<td>59</td>
<td>6.4%</td>
</tr>
<tr>
<td>Class project</td>
<td>58</td>
<td>6.3%</td>
</tr>
<tr>
<td>Book</td>
<td>52</td>
<td>5.7%</td>
</tr>
<tr>
<td>Magazine</td>
<td>48</td>
<td>5.2%</td>
</tr>
<tr>
<td>Scholarly book</td>
<td>45</td>
<td>4.9%</td>
</tr>
<tr>
<td>Thesis</td>
<td>14</td>
<td>1.5%</td>
</tr>
<tr>
<td>Total</td>
<td>917</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

was UH staff (inside and outside out of the library), followed by UH alumni, students, and faculty.

The Intended Uses

To indicate the intended use, the user has the choice of several options in a drop-down menu. The choices available were book, class project, magazine, personal, scholarly article, scholarly book, thesis, and other (see Table 3). The two largest categories of intended use were “personal” and “other.” These categories provided little insight into the ways that patrons were ultimately using digital library content. Because these categories are vague, the authors employed the existing intended use categories as additional context for coding the “Description” field. In order to answer the research questions, the authors determined specific ultimate uses and final products from the comments left by users in the “Description” field.

TABLE 4 Codes from the Free-Text “Descriptions” Field

<table>
<thead>
<tr>
<th>Description</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication</td>
<td>215</td>
<td>23.4%</td>
</tr>
<tr>
<td>Research</td>
<td>197</td>
<td>21.5%</td>
</tr>
<tr>
<td>Artwork</td>
<td>140</td>
<td>15.3%</td>
</tr>
<tr>
<td>Promotional</td>
<td>97</td>
<td>10.6%</td>
</tr>
<tr>
<td>Personal</td>
<td>83</td>
<td>9.1%</td>
</tr>
<tr>
<td>Video</td>
<td>51</td>
<td>5.6%</td>
</tr>
<tr>
<td>Exhibit</td>
<td>42</td>
<td>4.6%</td>
</tr>
<tr>
<td>Genealogy</td>
<td>39</td>
<td>4.3%</td>
</tr>
<tr>
<td>Presentation</td>
<td>28</td>
<td>3.1%</td>
</tr>
<tr>
<td>Instruction</td>
<td>17</td>
<td>1.9%</td>
</tr>
<tr>
<td>Gift</td>
<td>5</td>
<td>0.5%</td>
</tr>
<tr>
<td>Industry</td>
<td>3</td>
<td>0.3%</td>
</tr>
<tr>
<td>Total</td>
<td>917</td>
<td>100%</td>
</tr>
</tbody>
</table>
The “Description” field was a free-text field providing users the opportunity to describe their project. Sometimes users explained why they were requesting images. The authors used this field to generate a coding system to quantify the data (see Table 4).

The results of the coding of the descriptions are shown in Table 4. Once the coding was completed, the two largest categories were publication and research. It was determined that more refined coding of these categories must be done. This process will be discussed later in this section. Artwork was the third largest category after coding the “Description” field. Promotional and personal make up the fourth and fifth largest categories. The remaining description codes make up a small percentage of the total user requests.

After the results of the initial coding, the authors thought that the publication and research codes did not allow for detailed analysis, and more specific subcategories were developed (See Tables 5 and 6).

**Publication and Research Subcategories**

Refining the “publication” code showed that a majority of the descriptions were focused on popular culture books and articles. The next most frequent subcategories were for scholarly articles and scholarly books. The last subcategories of the publication code were industry books and industry articles.

Refining the “research” code into subcategories also demonstrated that a majority of the ultimate uses of images from the digital library fell into the personal subcategory, followed by academic research and “industry.”

**TABLE 5** Research Subcategory

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>132</td>
<td>67.0%</td>
</tr>
<tr>
<td>Academic</td>
<td>63</td>
<td>32.0%</td>
</tr>
<tr>
<td>Industry</td>
<td>2</td>
<td>1.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>197</td>
<td>100%</td>
</tr>
</tbody>
</table>

**TABLE 6** Publication Subcategory

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popular culture book</td>
<td>66</td>
<td>30.3%</td>
</tr>
<tr>
<td>Scholarly article</td>
<td>59</td>
<td>27.1%</td>
</tr>
<tr>
<td>Popular culture article</td>
<td>46</td>
<td>21.1%</td>
</tr>
<tr>
<td>Scholarly book</td>
<td>36</td>
<td>16.5%</td>
</tr>
<tr>
<td>Industry book</td>
<td>6</td>
<td>2.8%</td>
</tr>
<tr>
<td>Industry article</td>
<td>5</td>
<td>2.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>218</td>
<td>100%</td>
</tr>
</tbody>
</table>
DISCUSSION

In answer to the question “How are UHDL images ultimately used?,” the researchers found that specific user groups used images for different purposes depending on their work, need, and research areas. This conclusion reinforces the findings by numerous researchers, including Beaudoin (2014), Chung and Yoon (2011), and Harris and Hepburn (2013).

Visitors, the largest user group, were downloading images (particularly maps and photographs) for their own personal collections. Images were downloaded to decorate home and office spaces, to enrich genealogical research and family history, and to celebrate important life moments. Frequent uses also included researching local neighborhoods and houses and conducting “amateur” research. Additionally, individuals mentioned gaining “inspiration” from an object or objects in the UHDL. These people were downloading images as part of their creative process and using the content for various reasons, possibly to inform the artistic direction of their work.

These findings coincide with several of Chung and Yoon’s categories, including aesthetic value, emotive/persuasive purposes, and the generation of ideas.

A generation of idea use is involved in providing inspiration or provoking thought patterns; one example is looking for images to provide an artist with creative ideas ... an aesthetic value use deals with using an image because it is aesthetically pleasing ... an emotive and persuasive use is involved in stimulating emotions or conveying a message, as images are frequently used in the advertising and media fields. (2011, 165)

Examples from DCS users’ comments illustrate these inspirational and artistic uses of images:

- I am using vintage photos of Houston as table names for my wedding. There will only be one copy printed for the table.
- I’m an artist and would love to have high res digital files for the entire Narrenschiff ... for future reference. These prints have influenced a lot of my work and I would love to have them locally.
- I intend to use this letter from my great-great-great-great-grandfather for personal genealogical purposes. Thanks.

Staff are using images as tools to promote the university, share institutional memory, commemorate important dates in the university’s history, and market campus events and departments. These findings align with Chung and Yoon’s information dissemination, learning, and emotive/persuasive purposes coding schema.
An information dissemination use, the image itself is primary; this can be exemplified by a dissemination of a suspect’s photo by police officers... learning use includes gaining knowledge from the image. (2011, 165)

Examples of users’ comments from the DCS illustrate these images uses:

- To be used on a historical informational sign at the Houston Zoo in conjunction with the newest cougar at the zoo exhibit being named as Shasta VI.
- I’m working on an informational video about the services offered at the AD Bruce Religion Center and wanted to add some historical photos while discussing the history of the space.

Alumni are using images to reconnect with the university, to reminisce about their time at UH, and to celebrate important moments they experienced while on campus. Most alumni uses fall under a single Chung and Yoon image use category, emotive/persuasive purposes. Examples of users’ comments from the DCS illustrate these images uses:

- Sharing with my old college friends;
- My wife and I were recently married at the A. D. Bruce religion center. The photos will be used to commemorate the occasion.

Students were frequently using the DCS to download images for group projects, course papers, class presentations, theses, and dissertations. Faculty members said they used images in scholarly publications, primarily monograph books or journal articles. They also used digital objects as supplementary instruction material.

The ultimate uses of students and faculty coincided with nearly every category of Chung and Yoon’s image use coding schema: emotive/persuasive purposes, illustration, generation of ideas, information dissemination, information processing, and learning. Chung and Yoon defined illustration use as “images are used as a means of representing and encapsulating the object that is being described. For instance, teachers use images to illustrate what they are describing or explaining during class.” They further define information processing as “in a diagnosis by medical doctors. The data contained within the image is of primary importance” (2011, 165).

The first user comment below illustrates the authors’ contention that students and faculty use of images parallels all of Chung and Yoon’s categories. The second user comment mirrors Chung and Yoon’s definition of illustration use.
• Under the supervision of [my professor], we are making a 20-second video for KPRC Local 2 [a television station in Houston] in honor of Black History Month.
• For part of my dissertation I am reviewing records of the Sullivan Campaign to see how the soldiers perceived and experienced the natural environment. This hand drawn map by Sbreve will help to provide a frame of reference for my committee and readers.

To answer the second question, “What products are being produced using these images?,” the researchers discovered a wide range of products derived from the ultimate uses. The most frequently created products from UHDL content were publication-related materials in the form of popular culture products, such as information for articles and images in Houston History magazine, a commemorative anniversary book, and for multiple personal blogs and Web sites. Scholarly articles and books were also popular publication products. Some of the specific descriptions include information for scholarly articles in the fields of cultural studies, history, and psychology, as well as information and images for inclusion in college textbooks, encyclopedia entries, and scholarly biographies. Private and public industry created health and financial reports.

Examples of users’ comments from the DCS illustrate these specific products:

• The [organization] submits a monthly Houston History article to Absolutely Memorial. This month’s article is on Houston at the Turn of the Century.
• Essay on Foucault’s Madness and Civilization
• I am preparing a report for . . . a nonprofit group . . . that is assessing the way the built environment (e.g., streets, sidewalks, parks) can impact childhood activity and obesity levels.

The second most popular product created from UHDL images was research, which was shared with a variety of different audiences. Many of the ultimate uses pertained to personal research, including the discovery and dissemination of important family history and the acquisition of content for personal image albums and libraries. Other research products were either scholarly or industrial in nature, such as content for theses and dissertations and outreach material for private and public industry. Examples of users’ comments from the DCS illustrate these specific products:

• I am [a] Spanish ophthalmologist doing my doctoral thesis about glasses. The image is for illustrating my thesis.
• Scrap book on[ Rice | Hotel.
• I am performing work as a contractor for the U.S. Army Corps of Engineers on an outreach project that is located in Harrison County, Texas. Part of the
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The next most popular product derived from UHDL content was artwork. Users signified that they were accessing content in the digital library both to create art as well as to download images to act as decorative objects in their home and working spaces. Examples of users’ comments from the DCS illustrate these specific products:

- We would like to display these pictures for personal use in our home study. My husband and I both were raised in Houston, work in downtown, and I attended Rice University, and we find these pictures fascinating!
- I am a Houston firefighter that works at the station in the photo. We are having a reopening of our station on February 28th after a remodel and would like to showcase this photo.
- Background decoration for local theatre production in Cape Town, South Africa.

UHDL objects were also used to create a variety of other products, although there were only a few products in each category. Easy categorization of these particular uses has eluded the authors due to the diversity within the remaining categories and the small number of uses for each. Further studies and possibly focus groups may be needed to fully understand why so few users are using these images to create these products. Some of the questions that could be asked are:

- Why aren’t filmmakers using digital images in their productions?
- Why aren’t public speakers using digital images in their presentations?
- Why aren’t K–12 instructors using digital images in their classrooms and lesson plans, or encouraging their student to use them?

Videos included using content for documentary video productions. Exhibits included incorporating images and content into display panels and installations. Presentations included integrating images and content into public speaking engagements and professional presentations. Instructional resources included adapting content for educational and training materials and aligning digital objects with the K–12 lesson plans. Gifts included using digital objects to create “thank you gifts.” Example of users’ comments from the DCS illustrate specific products:

- Photos will be used in a video discussing the importance of bayous to the Houston ecosystem. The video is being created for educational purposes as
part of an outreach program by a non-profit dedicated to creating park space in Houston.

- I'm teaching a class next semester ... and I'd love to be able to have my students look through this text and illustrations when we discuss Chanel.

To answer the study's third question, "What implications do these ultimate uses have on other facets of digital library management?" the authors identified four library functions that can be directly influenced by the ultimate use of digital library materials: metadata creation, system design, marketing and promotion, and content selection. These four areas are important priorities in nearly every library.

The ability to find desired images relies heavily on the quality and relevance of the metadata describing that image. The authors of this article agree with Raya Fidel (1997, 182), who noted that popular descriptive metadata schema and standards, such as Dublin Core and AACR2, are sometimes too broad and universal in nature. This presents a challenge for consistent and accurate retrieval. To confront this limitation, the authors of this article are continuing to investigate how understanding ultimate uses of images can improve the metadata for those objects, thus their retrievability.

According to McCay-Peet and Toms, "descriptive and conceptual attributes are almost equally important to image users" (2009, 2425). Creating rich conceptual metadata that takes into account the user's own search queries encourages ultimate use by connecting images with users. It is not surprising, then, that understanding and applying user's taxonomies is critical in determining what will be used and for what purpose. Researchers have found that using concepts to describe images often generates more helpful metadata categories than fields that document image attributes (e.g., black and white, color, size; McCay-Peet and Toms 2009). Knowing how important conceptual subjects are to the retrieval and ultimate use of images, information professionals would better serve their users by identifying user-generated concepts in the form of comments, image requests (paper or digital), and other mechanisms, and implementing them into the metadata they produce.

User-created metadata gives information professionals insight into users and their ultimate use. Additionally, it opens the door for users to collaborate in the metadata creation process. Other researchers, such as McCay-Peet and Toms, have suggested that "social tagging complements professional indexing" (2009, 2417). If user-generated metadata in the form of social tagging, commenting, or image request (paper or digital) is to be solicited, system designers must create a mechanism that collects this metadata and disseminates it to decision makers. This can be as simple as allowing comments to be stored in a database that can later be queried by digital repository managers or leveraging existing software to collect usage information in meaningful ways. Some homegrown applications, like the DCS,
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unintentionally collect ultimate use data. Other platforms, such as CONTENTdm, allow administrators to generate reports from user comments, making the analysis of data more feasible and showing the diverse types of user feedback.

Not all libraries will have the resources to use these platforms. In such cases, others may have the opportunity to investigate ultimate use through user commenting features found in tools such as Facebook, Flickr, blogs, and patron request forms (paper or otherwise). While this “hands-on” approach to collecting ultimate use data can be laborious, the information yielded from the activity is fruitful in many ways, including but not limited to enhanced metadata generation and the marketing and promotion of collections.

Increasingly, libraries are turning to marketing and promotion to make users aware of their services and collections. As with any marketing and promotion campaign, knowing key audiences and their needs are important first steps to any outreach effort (Cole, Graves, and Cipkowski 2010). This is especially true of digital libraries, because few tools provide granular data about users and their specific needs. Over time, librarians have developed several methods to gather as much user information as possible, including user surveys and Web site metrics like Google Analytics. However, ultimate use has not traditionally been gathered. Data from any ultimate use analysis can provide an expanded view of digital library users and their ultimate uses, making marketing efforts easier.

Data from the DCS can illustrate how ultimate use can drive a marketing and promotion campaign. One infrequent user group in this study was UH History Faculty. They may be unaware of the primary sources available in the digital library and how these materials can enhance their research and scholarly output. UHDL staff could target this audience by developing marketing materials that communicate both the accessibility and possible uses of digital library content. Harris and Hepburn emphasized this idea, stating that “if libraries and archives can better promote available resources, obstacles to access may be mitigated” (2013, 278).

Another implication of ultimate use data for digital libraries is future content selection. Harris and Hepburn suggested that to generate meaningful and relevant content, librarians must understand who uses digital libraries and why (2013). Digital library best practices often state that selection decisions are based on a host of criteria, including uniqueness, intellectual value, physical condition, copyright status, and institutional priorities. While the authors believe that ultimate use should be another criterion when making content selections, this approach is often underutilized by selectors, perhaps in part because the mechanisms and the data needed to determine ultimate use are difficult to implement and laborious to collect.

An example from the DCS demonstrates how effective ultimate use data could be to support selection decisions. Data revealed that users created
art or artistic products and also gained inspiration by using UHDL content. Knowing this information, curators could consider choosing a more graphically or visually appealing collection over a text-based collection in putting together their digitization priorities.

As suggested in the UHDL example, ultimate use data can give artists or other users a “virtual” voice in collection decisions. In this vein, Harris and Hepburn also talked about giving historians a physical voice in digitization efforts:

Collaboration among librarians, archivists, and historians should shape digitization efforts. This goes beyond promotion of the materials. It means engaging scholars in developing online collections. Collections enhanced by scholarly input should find greater use by the scholarly community since digital collections would reflect the needs and expertise of the users. (2013, 283)

CONCLUSION

With academic institutions, cultural and historical centers, and government agencies adding millions of images to digital libraries each year, the collection of ultimate use data will be an important factor in their growth and use. The inclusion of ultimate use data allows for alignment of interests to specific users and uses. For example, including historians in the selection process will increase the likelihood of them using digital library images in their scholarly articles because they will be aware that those images exist. An alternative example from the selectors’ side is the recognition of a digital library manager that their collections are being used for artist inspiration. As a result, providing more visually interesting collections may be a way to offer artists more inspirational digital materials.

Adding ultimate use data to the digital library toolkit may mitigate barriers to use, especially in underserved communities such as faculty, students, and historians. With better promotion, user enhanced metadata, subject specialists’ collaboration in the collection/image selection process, and systems designed with collecting and analyzing ultimate use in mind, digital library innovators can bring to light exciting primary resources, offering research and personal enjoyment materials to those who may not be aware that these resources exist or that images are available for use.

This article is only a small subset of the research that could be conducted on ultimate use. The authors have identified other research topics to be explored in the future, including highlighting additional implications for digital library management, examining mechanisms to more easily capture ultimate use data, and exploring the expansion of the types of data sets needed to
determine ultimate use. Hopefully, future studies will seek to align ultimate use with digital library management.

ABOUT THE AUTHOR

NOTE

1. The definition of a digital library has been debated among the profession for decades. For other examples, see Christin Borgman 1999; G. G. Chowdhury and Sudatta Chowdhury 2003; Daniel Greenstein and Suzeanne Thorin 2002.

REFERENCES


