Abstract
Digital libraries of archival historical and cultural resources are expensive to create and maintain. Thorough assessment of both the service itself and the collections selected for digitization can demonstrate the success of the project as well as the value of the digital library and will aid future funding requests. As evident in the research literature, while digital libraries are often evaluated on the basis of usability, only rarely are users asked about the value or usefulness of the content of the digital library. Useful or valued collections will attract additional users, will help inform decision making for future projects and will make evident to funding agencies that resources have been well spent. Usefulness, however, is amorphous and challenging to measure. A digital library of archival materials developed at a large academic institution was used as the case study. The goals of this project were to determine how to ask users about usefulness and value of collections in the digital library; and to collect statistical data applicable to the question of usefulness. Combinations of both qualitative and quantitative data were analyzed, presuming that the multiple perspectives and data points would lead to comprehensive and actionable results. The data gathering methods included web and database analytics as well as interviews and a survey. The research resulted in specific suggestions for the improvement of the digital library, results applicable to many digital libraries.

Keywords: Digital Libraries; Evaluation; Assessment; Hybrid Methods, Usefulness

Introduction
Digital libraries (DLs), broadly defined, organize digital assets in searchable and accessible online collections. They may contain everything from historical images to journal articles to scientific data and they operate on a plethora of software. DLs are expensive undertakings. The assets must be selected, digitized, stored and described; user interfaces developed; and everything must be migrated and sustained. As with any expensive endeavor, regular evaluation of the system and contents is essential to keeping the DL relevant and useful. Evaluations of DLs inform improvements in the current systems and the design of future systems, demonstrate return-on-investment and impact on the community; and aid in determining the priority of future projects.

Typically, DL evaluation has centered on usability, measuring the ease of use, navigation and appearance of the DL. From online shopping sites to collections of cultural objects, the research literature on DL evaluation abounds with usability studies. A less asked and less studied aspect of DLs is usefulness. Usefulness measures whether the content of the DL is germane to the users; that is, whether the content fulfills an information need.

Background
The best engineered interface is of little value if the digital assets it presents are not relevant to the users. Although usefulness would appear to be fundamentally important, it has been relatively little studied. As highlighted in the 2005 JISC study on digitization in the UK, digital projects have emerged in a “piecemeal fashion.” “Moreover digital projects have tended to be driven by supply rather than demand, spurred by opportunity instead of actual need.” (JISC 2005, p. 2). With rich collections of archival and cultural materials, those that have been digitized are those the organization housing the materials presumed the users needed or wanted. As Birrell (2010) wrote: “Traditionally, digitisation has been led by supply rather than demand.”

Likely part of the reason that usefulness has been less often studied is that usefulness as a concept is difficult to define. The user simply knows a useful resource when she finds it. Marchionini (2003) wrote: “Needs assessment research in information science recognizes that there are different levels of needs that users may not be able to articulate.” (p. 120) Likewise usefulness is transient. Digital objects of no importance to a user one day may be the answer to an information need the next day. Or a digital object irrelevant to one user may be essential to another user. To be useful the digital asset must be located just in time.
Usefulness is inextricably linked to usability. Interface is a significant factor in the perception of the quality of the DL; thus technical, interface, and performance measures cannot be ignored. A DL brimming with resources will be useless if the interface is difficult to use, or the metadata is too coarse for the asset to be discovered or properly placed into context.

Even though users may find assets through metasearch engines, the DL’s own interface must be constructed in order to provide a search the user executes easily, with confidence the search will result in all the pertinent assets. Without a reasonably functional interface and clear metadata the digital object will be undiscovered or rendered useless. The interconnections between usefulness and usability make it difficult to study one without the other.

Usefulness is also more difficult to quantify than usability. Page counts, time spent on pages, the number of downloads are important evaluation criteria. A highly specialized digital library, however, may have a relatively small user base. While the number of page counts and downloads may be small, the DL could be vitally important to this user group. Easily quantified units of measure, such as page counts, used without context, are not always dependable measures.

Despite the effort placed in developing usable systems, the user may not even access the digital assets through the DL’s own interface. With metasearch engines, the direct use of many digital libraries is discretionary. Increasingly, the user working through Google may have little concept of where the chosen digital object actually resides and the location of that digital object may not be relevant to the user’s work.

In an increasingly connected world, the audience will likely be more expansive than the target audience of the DL. Potential users are anywhere and the uses they may have for a digital object may be unanticipated by the DL developers since digitized materials are without geographic or physical restrictions. Lynch notes: “digital libraries are showing a disconcerting and exciting tendency to find their own user communities, which may be very different from the user communities envisioned or designed for by the digital library developers.” (2003, p. 196) DL developers now must anticipate that the constituency may be much larger and the usefulness of the digital object may be far broader than originally intended.

Thus, usefulness combined with usability will inform future directions for DLs. Assessing the value of the service by incorporating both usefulness and usability measures will help developers demonstrate a return-on-investment to administrators and funding agencies. Also, usefulness and value can support appeals for additional funding or support for future projects. Measuring for usefulness helps developers better understand user needs and demands. Along with usability, value measures can also help guide improvements or corrections in the service. Lastly, with rich cultural heritage and archival collections remaining to be digitized and budgets constrained, usefulness could help determine priorities for future projects.

The evaluation project described here aimed to both assess the digital library and to determine which methods or combination of measurement methods yielded actionable results. The digital library at the San Diego State University’s (http://ibase.sdsu.edu) Library and Information Access houses diverse assets including forty thousand archival photographs of the university, the student yearbooks, nearly nine thousand issues of the student newspapers, a collection of California murals, Chicano posters, alternative student periodicals, historical postcards and other diverse collections. Like many libraries, SDSU has limited resources but a wealth of archival and historical collections. Setting priorities for digitization is challenging when a large and diverse number of worthy collections compete for limited resources. The recent economic challenges also increased the importance of demonstrating the value of the DL to administrators who allocate funding. In addition, analyzing the value of the DL also necessarily involves analyzing the interface and operability, which could be used to improve the service. Usability can alter the users’ perceptions of the DL and thus aspects of usability were included in the research. Further, while the existing interface to the SDSU digital library was functional, any online system must undergo regular improvements and adjustments to apply new technologies and improve services.

Literature Review

Usability studies are myriad; the literature offers comparatively little for usefulness or impact. (Showers, 2103). Generally, DL research literature supports the use of multiple evaluation tools including both quantitative and qualitative methods. (Marchionini, 2001). A combination of automated analyses, interviews and observations can provide information about large numbers of users with little context; while more qualitative methods provide contextual information about a smaller, though representative number of users. (Blandford & Bainbridge, 2009) Wilson (2103) defined and described mixed-method research emphasizing the use of both quantitative and qualitative measures. Meyer (2011) discussed the assessment of several digitization projects in the UK all evaluated through multiple methods. Adzobu (2014) described a multi-faceted review of a digital library at a public university with an emphasis on user needs assessment.

Several evaluations of DLs included questions or sections specifically inquiring about usefulness or impact of the content. Xie (2008) addressed usefulness in research examining users’ perceptions of two digital libraries. The
responses illustrate the importance of usefulness to the clients. Several respondents commented on the interconnectedness of interface design and collection quality. The DiSCmap project formed the basis of a usefulness study conducted by Birrell and co-authors (2011). They directly analyzed usefulness with the goal of determining digitization priorities and recommending strategies for cooperation among digitizing organizations. Warwick (2008) asked users about the usefulness of digital resources, observing from their data: “there is a very wide range of resources being used, and very little agreement as to which are most useful.” (p. 92) Fuhr, et al. (2007) specifically addressed usefulness in the conceptual model they designed for the evaluation of digital libraries. The authors described usefulness as “reflecting how users perceive the relevance of a DL with their needs, the width, the breadth, the quality, as well as the validity of its collection, and the ability to serve their goals.” (p. 28) They advocated mixed methods such as user studies, information behavior and content-related studies. Petter, DeLone & McLean (2012) reviewed the history of information system success and noted “use and outcomes should be the real focus of IS success measurement within organizations.” (p. 354) In their observations organizations tend to neglect the role of the user and fail to focus on how the system is used and whether users are satisfied. Schlosser and Stamper (2012) drew attention to the lack of data on the user of digital collections. They advised promotion of digital collections to make potential users aware of the resources and increase use. They also noted that just because a collection is digitized does not mean that the resources will be used.

**Methods Employed**

Based upon current research, the SDSU digital library was evaluated using a multi-faceted approach. Quantitative methods and qualitative methods were combined to obtain data on both the usability of the system and the usefulness of the contents. The study included brief interviews, expert evaluation, quantitative data from Google Analytics and native database reports, and finally an online survey. The methods were selected to obtain a diversity of data efficiently and with little cost.

The  **online survey** was linked to the database entry page in an attempt to obtain data from users of the DL. The six question survey asked viewers if they found what they were looking for, and if they found the digital archival resources available useful. They were asked for suggestions for making the site better as well as suggestions for resources to add. The survey return was too small to be statistically relevant.

**Quantitative data** collected from the native database reports and from Google Analytics provided solid information on site usage. The DL operates on customized software developed by iBase. Two of the most significant reports provided by the iBase database are **No Results Searches and Most Popular Searches**. Both reports include user data from the DL launch in 2010 to March 31, 2014. According to the **Most Popular Searches** table, the most commonly searched terms were selected from the list of controlled vocabulary. The six most searched terms on the controlled vocabulary list: 20th Century; People; Campus Buildings and Areas; B; San Diego State University; 1970s photos. (Personal names are organized alphabetically, thus all surnames beginning with a B could be browsed.)

Selection of very broad categories from the controlled vocabulary suggests that many users were browsing or were unsure of the materials held in the database.

A free text search box is available from most pages. When users utilized the free text search box, the searches were more specific. 47% of all searches typed in were personal names. Places and building names also featured prominently in the most common searches. Table 1 displays the most commonly searched terms grouped by category.

![Table 1. Search terms used 2010-2014](image)

Further, users browsed all thirteen collections every month; none of the collections was overlooked. The University Archives Photograph Collection and the Student Newspapers are the two most browsed collections, which may be expected, as they are also the largest collections.

The **No Results** reports show a gradual change. Through 2013 searches with no results were primarily Names of persons, Identifiers (the unique numbers given to each digital object), Places and then Dates. The most common reason for a lack of results was that the database contained no items to meet the search requirements. Users infrequently mistyped or misspelled searches. In contrast, the 2014 data show Dates as the most frequently searched
items returning no results, followed by Names and then Identifiers. The date searches returned no results nearly always because the user typed in a two-digit year rather than the four-digit year required by the database. Another reason for no result searches was a misunderstanding of the advanced search page. Users sometimes typed words or dates into the Identifier field. Likely, users ignored or did not see the field labels and simply typed their queries into the first available search bar, which is a fielded search for Identifier.

Google Analytics offers a complimentary set of data. Data from Google Analytics cover March 2013 through March 2014. The reports from Analytics helped determine what searches brought users to the DL. Though Analytics does not report the terms users searched in Google, it does display the search term typed into other search engines such as Yahoo or the SDSU library’s site. The Organic Search Traffic table shows the searches conducted in a search engine which resulted in a link the user followed to the DL. As shown in Table 2 more than half of the non-Google search engine searches bringing users to the DL were for personal names. Searches for music, objects including art, places and buildings also resulted in users clicking through to the DL.

Table 2. Organic Search Traffic

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<th>Category</th>
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<td>IBASE.SDSU</td>
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<td>EVENT</td>
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<tr>
<td>ATHLETICS</td>
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<td>OTHER</td>
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<tr>
<td>PLACE</td>
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<tr>
<td>THING</td>
<td>0.0%</td>
</tr>
<tr>
<td>MUSIC</td>
<td>0.0%</td>
</tr>
<tr>
<td>NAME</td>
<td>60.0%</td>
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Another Analytics report, All Traffic – Landing Page, lists the page on which the user first enters the DL, even those entering from Google. The search terms can often be intuited from the landing pages. When a user clicks on a link from a list of search results, from any search engine including Google, Analytics records the DL page on which the user landed. More than half of the landing pages were clearly associated with a search on a personal name.

According to the All Traffic – Site usage table the number of users per month remains stable at approximately 1100 sessions. Users spend an average of seven minutes on the site and view around twelve pages per session. Users accessing the site from a Google search view on average seven pages and stay three minutes. Those users who access the site directly through bookmarks or typing in the URL view an average of twenty-one pages and stay longer at the site than other users, about seventeen to eighteen minutes. Users who enter the DL from the library’s web site view the most pages, twenty-five, and stay for about fourteen minutes.

Turning to qualitative methods, the University of Buffalo, New York, Library and Information Science 516 class, Information Sources in the Social Sciences conducted an expert review of the DL under the direction of Professor Lorna Peterson. The class was asked for an analysis of the value of the contents of the DL to the university and the community and to assist in the identification of other potential digitization projects. The report constituted a significant portion of the students’ grades. The students’ final recommendations addressed usability, especially interface design issues, such as the need for a larger font and reorganization of the home page to better utilize the space. Recommendations for the search system and metadata included taking better advantage of the controlled vocabulary and providing pop-up help windows to assist users. The evaluators also noted a lack of a stated focus or mission for the DL.

Among the recommendations for additional digitization, the class supported a focus on collections of local interest. They suggested continuing digitization with collections concerning local San Diego companies, especially those started or directed by SDSU alumni, and a focus on immigration and border issues as well as international trade. (San Diego lies on the US border with Mexico.) The class further recommended the use of social media to better promote the site.

Lastly, staff conducted brief interviews in an effort to obtain insight from non-users of the DL. Following best practices, the survey was kept brief and the questions direct. (Iarossi 2006) The survey asked two primary questions: 1. Do you think these kinds of digital libraries are useful? 2. Please suggest other materials for digitization. The only personal question asked was the volunteer’s affiliation with the university. The sample included a majority of undergraduate students, several staff members, two unaffiliated persons, two alumni, two graduate students and two faculty members. The volunteer sample reflects the population of this primarily undergraduate school. As responses became increasingly redundant, recruitment was halted at twenty-five volunteers.

For the interviews random volunteers were approached at their work or study area. All were working on their own computers. Observers asked the volunteer to navigate to the DL using the volunteer’s own computer. Observers
presented a brief and informal introduction and asked the volunteer to locate a resource using the DL. If needed, the observer suggested search terms that would result in a diverse set of results, such as buildings on campus or football, which would return both images and text resources. The observers conversationally asked volunteers if they had seen the site previously, and for their opinions concerning the usefulness of the available resources. The observer asked if the volunteer knew of any resources in her/his discipline, or in his/her interests that are not digital, but would be more useful if digitized. The observer noted the volunteer’s approach and success at locating a resource and reactions and answers to the questions.

None of the volunteers had seen or used the DL previously. Nearly all volunteers suggested that the DL must be underutilized because it was unknown. Nearly all the volunteers suggested a program of promotion for the DL principally using social media. All but one volunteer considered the DL valuable. Without prompting all of the volunteers offered reasons for why the DL is useful as shown in Table 3. Most addressed the importance of preserving the university and city histories. Many reflected that the materials held in the DL would be unknown to users before digitization and how the DL increased the accessibility of these resources. Several simply expected the library to digitize and develop digital libraries as part of the library’s mission and service.

Table 3. Why the digital library is useful


When asked for suggestions for future digitization projects some volunteers suggested electronic textbooks or the answer keys to exams. As the volunteers had never thought about digitization, superficial answers or suggestions that would personally aid the volunteer were to be expected. Other responses, however, were much more thoughtful. Observers’ suggestions for digitization projects included: graphic arts and comics; local and neighborhood newspapers and newsletters, playbills, photographs and video from student performances; photographs of student and faculty works of art; oral histories, particularly with SDSU alumni; anything relating to border issues and immigration. The digitization suggestions segue with the interests of the community; San Diego hosts the Comic-Con International, the city is located on the border with Mexico; and the university has strong performing arts departments. Interestingly, few volunteers mentioned interactivity. One suggested allowing artists to upload their own photographs; another suggested an interactive yearbook.

Discussion

Both quantitative and qualitative data suggest that patrons are finding useful materials in the DL. The DL has maintained steady use, all collections are regularly consulted, and the expert evaluators and interviewees valued the resources.

The results of the interviews and expert evaluation can be viewed through the framework of total economic value, a means of cost-benefit analysis. Total economic value is a means of determining the worth of non-commodities such as the environment or libraries. Existence value is when on-users value the DL even though they do not have an immediate need for the resources it holds as demonstrated in the comments obtained in the interviews. Option value was also expressed; the non-users enjoyed knowing that the DL exists. The volunteers appreciated the DL for prestige factor of finding resources associated with the user, in this case the university, have been valued enough to be included, as well as bequest value, an appreciation that the materials will be available into the future. (Matthews 2013; Tanner 2012).

Also, the expert evaluators and the interviewees agreed upon the significance of collections of local interest and history. Concentrating on materials specific to the university and city would help provide a focus and mission for the DL. Additionally, users frequently searched for names both within the database and through search engines. This may be a reflection of the resources held in this particular DL or may be indicative of the use of the Internet for social connections. Either way, the data support the prioritization of collections concerning SDSU and San Diego people, groups and organizations.

The quantitative data are less amenable to interpretation. It is challenging to compare statistics from one digital library to another. Too many factors influence the data, including the audience, holdings, and software, to make relevant comparisons across DLs. One of the best uses of the data will be to compare the DL against itself over time and after improvements or additions.
Accordingly, the evaluation has spurred enhancements in the DL. Addressing several of the interface issues, a redesign will be rolled out in the summer of 2014. Since many users took advantage of the controlled vocabulary, the list will be featured more prominently in the new design. The fielded search screen will be altered so that the Identifier field is not the first search box. Also, since many failed searches were the result of malformed dates, the new design will include help on date searching.

The research results also influenced the prioritization of digitization projects. The digitization of a post card collection containing San Diego and California images was begun in 2013 in an effort to include additional local materials.

The interviews and evaluation pointed out the need to publicize the DL. Based upon her research Matusiak (2011) advocated better promotion of unique digital collections and better strategies for gaining the attention of users. The Schlosser & Stamper (2012) research concurred with the importance of promotion to direct users to appropriate resources. Thus, the SDSU digital library will undergo two more evaluations. The first will compare this current usage data to data obtained after the new interface is brought online. The second phase will include a social media promotion campaign to determine if awareness of the DL can be increased and which methods of social media work best.

Conclusion
The primary purpose of this research was to determine if a combination of measurements could lead to practical data concerning the usefulness of a digital library. With little library and archival literature to draw upon, the project used several quantitative and qualitative methods. The research confirmed the usefulness of the current collections and indicated new digitization directions. In addition, the research inspired alterations to the interface to address usability issues. The research validates the use of hybrid or mixed methods to present a more comprehensive picture of the usefulness and usability of the digital library.

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