Use and Users of Digital Resources
A Focus on Undergraduate Education in the Humanities and Social Sciences

GOAL 1: UNDERSTANDING THE HUMANITIES/SOCIAL SCIENCE DIGITAL RESOURCE LANDSCAPE AND WHERE USERS FIT INTO IT

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April 5, 2006

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* This work was made possible by generous funding from the William and Flora Hewlett Foundation and the Andrew W. Mellon Foundation. Additional support was provided by the Hewlett-Packard Company, the Center for Information Technology Research in the Interest of Society (CITRIS), the California Digital Library (CDL), and the Vice Chancellor of Research, UC Berkeley.

Please cite as:

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GOAL 1: UNDERSTANDING THE HUMANITIES/SOCIAL SCIENCE DIGITAL RESOURCE LANDSCAPE AND WHERE USERS FIT INTO IT.

Primary goal: To define the universe of digital resources available to undergraduate educators in the humanities and social sciences and to examine how understanding use/users can benefit the integration of digital resources into undergraduate teaching. Part of this goal was to facilitate the gathering of comparative use data across a wide variety of humanities/social science (H/SS) digital resources. Activities directed toward this goal included creating a map of the universe of digital resources available to undergraduate educators and consolidating existing knowledge about the use and users of these resources.

A. Defining the universe of digital resources and associated user studies

Our first step was to conduct an analysis and overview of existing knowledge about use, and the methods for tracking use, of unrestricted digital resources. We have (1) reviewed and synthesized the existing literature on user studies relevant to unrestricted digital resources, (2) created a preliminary classification of select unrestricted digital resources in the humanities and social sciences, (3) through interviews, analyzed what developers/funders want to know about how (or if) unrestricted humanities/social science resources are being used in undergraduate teaching contexts, (4) analyzed what select developers/funders are doing, and how much they are spending on user research, and (5) analyzed what developers know and their perspective on the best methods for measuring resource usage.

The key challenges to pursuing an analysis and overview about use included:

- Agreeing on how to define a collection of digital resources
- Agreeing on a set of characteristics for certain types of resources as we developed the digital resource classification
- Determining how to integrate the various perspectives of different types of site “owners” and users
- Identifying those sites most likely to yield information that could be generalized to a wider universe of resources.

1. Unrestricted digital resources: What are they? How can we organize them?

Some background, both on our subject of study and our attempts at classification, is necessary from the start.

The ACLS Commission on Cyberinfrastructure for Humanities and Social Sciences (2004) recently noted that digital objects and data in humanities digital resource collections tend to be far more complex and ambiguous than their counterparts in the sciences. Waters (2004) discusses factors contributing to the sustainability of digital scholarly resources. He notes the significant problem of the sometimes “disconnected jumble” of library digitization projects that do not connect across institutions. Smith (2003) looks at preservation and sustainability issues around “wholly new types of information resources, so novel that no common term except ‘digital objects’ or ‘sites’ can describe them.” We argue throughout this report that when non-library digital resources (a ubiquitous element in what most users desire from resources) are added to the mix, the impact on ease of use is obvious and profound.
Attempting to classify the mass of material available to users can be approached in myriad ways and presents many challenges, as we describe in some detail below. For example, a major study codified over thirty digital library aggregation services and non-library digital resources into clusters and described a typology for classifying specialized digital resources collections (e.g., American Memory, MERLOT, and Perseus) (Brogan, 2003). Although some useful definitions for classifying the ever-widening field of digital resources are developed, the study analyzes only those digital resources that adhere (to a large degree) to the Protocol for Metadata Harvesting of the Open Archives. As we discuss below, there is a tendency for classification schemes to only focus on small corners of the universe (i.e., cultural heritage institutions or, more often, formal digital libraries).

For our project, we have chosen a much larger universe of digital resources, which requires a rethinking of terminology, classification schema, and analytical approaches.

2. Definitions: What are we studying? What do faculty use in their teaching?

Since the outset, this study has been concerned primarily with unrestricted digital collections that support research and teaching in humanities and social sciences. Little did we know when we started that this term would engender so much confusion among the diverse groups with which we have been conversing. We determined shortly after commencing that we were on the right track, but a subtle redefinition of our subject of study was imperative.

We found, for example, that the term “digital collections” is often used synonymously with “digital library collections.” This study, in contrast, is primarily focused on unrestricted digital resources that may reside in or outside of libraries. Our choice of the term “unrestricted” meant we would include resources of digital information that are freely and publicly accessible via the World Wide Web, such as mixed media (encoded texts, images, sound files, video, etc.) as well as metadata. Such resources proliferate in digital libraries (which have for some years now been digitally reformatting materials in special, archival, print, photographic, and other resources), museums (which create and distribute digital surrogates for artifacts and works of art in their resources), and archives. But they are also created by individual scholars (for example, as references to aid their teaching or as supplementary and supportive materials to research publications; Read, 2003), and by scholarly initiatives (e.g., the Oxford Text Archive and UVA’s Institute for Advanced Technology in the Humanities). They may also include resources that reside on a variety of media sites (e.g., The New York Times) and in government databases (e.g., USGS). As a result, we distinguished such unrestricted digital resources from restricted resources of books and journals (e.g., JSTOR, Highwire Press, CIAO at Columbia University Press, NAS Press) and those resources that comprise nothing but descriptive information for, and pointers to, other information objects (e.g., Melvyl).

Our data gathering reinforced our decision to maintain the broadest possible definition at the outset. Faculty, when asked (as opposed to being told what resources are of value), made clear that the variety of unrestricted digital resources available to potential users is extensive and

http://www.openarchives.org/OAI/openarchivesprotocol.html

http://digitalresourcестudy.berkeley.edu
diverse; it is not just text and it does not just emanate from libraries or any other single source. As to the term  
unrestricted, it has limited utility. We soon discovered that faculty in research universities use a wide variety of licensed digital resources, but consider them to be “unrestricted.” They make no distinction between, say, RLG Cultural Materials and a digital collection such as MOAC.\(^{16}\) For these faculty, both are accessible; most faculty have no idea (until they are told or lose access) that the former is available only because their institution has licensed it. Another issue is illustrated by using RLG Cultural Materials and MOAC again as examples. The fact that these two digital collections have overlap in their content (and with other resources as well) presents a host of complications in understanding user behavior, especially around the issue of discovery. In a world where digital objects are represented in multiple spaces and places, the user has numerous ways of finding an object and may use various pathways to pluck a desired item out of a “collection.”

Therefore, for the purposes of our project, we replaced the ambiguous term “digital collections” with “digital resources.” Digital resources, for our purposes, encompass those objects that employ rich media and span text, images, sound, maps, video, and many other formats. The source of these resources is equally broad, and can include formal collections of resources developed by well-known institutional entities, such as libraries and museums, as well as those developed by individual scholars. Faculty have various types of digital resources from which to choose, depending on their given needs. Significant digital resources may be located in the deep web, buried and beyond the reach of Google (e.g., databases such as JSTOR, RLG, etc.), or behind password-protected course websites. Although we are particularly interested in free content, we considered any resource that faculty said they use, regardless of whether it is restricted or not.

B. Understanding use and users: A literature review.

1. The larger context for understanding technology and the humanities and social sciences.

The overall higher education context of studying humanities/social science users of digital resources is immense and complicated. We outline some major initiatives and thinking here. First, there has been an increased interest in understanding users in the digital library realm (e.g., Borgman, 2003; Waters, 2004; Grant, 2003; Blanford and Buchanan, 2003; George, 2003; Tenopir, 2003; and Marcum and George, 2003). Second, there have been ongoing efforts to understand the technology needs of users in the larger H/SS community and the undergraduate classroom. The available, and often overlapping, perspectives span professional societies, libraries, instructional/educational technology, pedagogical research, and distance education. A few of the notable works are discussed below.

**Humanities and technology:** In 2000, the Building Blocks project of the National Initiative for a Networked Cultural Heritage (NINCH)\(^ {17}\) conducted a survey by field and discipline in the humanities. The survey was designed to increase the involvement of humanists in the future design of networked computing. NINCH’s findings were used to initiate twenty digital

\(^{16}\) http://culturalmaterials.rlg.org

\(^{17}\) http://www.ninch.org
projects for humanities resources, aiming at meeting users’ expressed needs. Building Blocks built on two seminal projects conducted by the J. Paul Getty Trust.\textsuperscript{18}

The Digital Initiatives Database Project queried users about electronic resources and generated a web-based registry of digital projects that were produced by libraries.\textsuperscript{19} This effort appears on its face to have stalled, and their list is quite thin when compared to the U.K.’s robust Humbul Humanities Hub database of humanities digital resources.\textsuperscript{20} Other active U.K. organizations are the Resource Discovery Network (RDN), the national Arts and Humanities Data Service, and the Digital Resources for the Humanities (DRH) group.\textsuperscript{21}

The work of the NINCH and ARL initiatives has clearly influenced, by virtue of common sponsors and/or overlapping personnel, a recent effort by the American Council of Learned Societies (ACLS) Commission on Cyberinfrastructure for the Humanities and Social Sciences. The commission was charged to describe, analyze, and provide recommendations on the current state of humanities and social science cyberinfrastructure; its ambitious draft final report was published in fall 2005 for comment. The commission report does not devote discussions specifically to teaching, however.

\textbf{Real and virtual classrooms}: There are numerous investigations of how digital resources are used in real and virtual classrooms. In our opinion, the most robust work to date in this broad area is concentrated on science, technical, and vocational education. Systematic research concerned with the humanities is much rarer and, when available, tends to focus on limited case studies.

Much work investigating users of technologies in courses has been accomplished by the educational/instructional technology and distance education communities (see, for example, publications by ALN Magazine, Syllabus, the Technology Source, Innovate, etc. \textsuperscript{22}) Meta-literature reviews are available on the thorny issue of learning outcomes (e.g., Phipps and Merisotis, 1999; Waxman \textit{et al.}, 2003). Others are more broadly concerned with economic and institutional issues (Fisher and Nygren, 2002, for the A. W. Mellon CEUTT studies; Lorenzo and Moore, 2002, for the Sloan Consortium; Twigg, 2003, for the Pew Course Redesigns). In addition to the burgeoning literature on distance education in the journals noted above and


\textsuperscript{19} http://www.arl.org/did

\textsuperscript{20} http://www.humbul.ac.uk

\textsuperscript{21} Links to all of these projects can be found at http://www.ahrc.ac.uk/ictmap. JISC (U.K. Joint Information Systems Committee) (2005) has published a strategic plan for 2004–2006, which includes the goals to “ensure ICT is embedded within post 16 and higher education, develop eResearch infrastructure and use, and help institutions manage investments in ICT.”


http://digitalresourcetudy.berkeley.edu
elsewhere, NSF has recently commissioned a literature review about the implications of information and communications technologies for distance education.23

The U.K.’s Joint Information Systems Committee (JISC) and NSF have just recently funded a variety of projects through the Digital Libraries in the Classroom Programme.24 The charge is to investigate the integration of resources into teaching contexts. One project now underway is Digital Anthropology Resources for Teaching (DART) at the London School of Economics and Columbia University.25 A report on their progress can be found on their website, although the report is primarily focused on technical issues and includes no work on user studies per se (Dahlquist et al., 2005). Another JISC/NSF project is The Spoken Word, now being pilot tested with instructors and students at Michigan State University and Northwestern University.26 Glasgow Caledonian University27 is digitizing much of the BBC’s radio archives into a collaborative digital sound archive that faculty in history and political science will be able to access, segment, annotate, and wrap into teaching materials. Their website says, “We are simultaneously embracing the socio-technological world of the modern learner. The use of blogs in teaching and showcasing audio, and the investigation of delivery of audio to mobile devices are just two of the ways in which we are responding to the practical needs of our users.” A perusal of their website indicates evaluation materials related to users is not yet available from this project. An evaluation to measure the key impacts of the projects developed under the Digital Libraries in the Classroom Programme is being performed separately.28

Brogan (2005) in her review of American Literature/American Studies, describes the profusion of resources available to faculty and students in this field, and points to numerous programs focused on integrating these resources into the undergraduate teaching. Among the programs she references are those developed by individual scholars (Voice of the Shuttle), and larger efforts such as the Visible Knowledge Project at Georgetown University and the Center for History and New Media at George Mason University.29

The American West Project is centered at the California Digital Library and is funded by the Hewlett Foundation.30 This ambitious project has among its goals “to assemble an American West virtual collection drawing from the resources of major research institutions.” The virtual collection “will be assembled and presented with a range of tools supporting extensive reconfiguration [and] integration with online learning environments.” The development of these tools is being informed by assessments conducted with a variety of audiences including university librarians and K–12 teachers.

**Improving undergraduate education:** There are numerous initiatives that target improving undergraduate education in colleges and universities. Many of these are institutional activities.

23 The National Science Foundation under the Implications of Information Technologies Initiative http://srsweb.nsf.gov/it_site/it/infotech.htm.
24 http://www.jisc.ac.uk/index.cfm?name=programme_dlicht
25 https://dart.columbia.edu
26 http://www.jisc.ac.uk/index.cfm?name=project_spoken_word
27 http://www.gcal.ac.uk
28 See http://www.jisc.ac.uk/index.cfm?name=funding_diglib. As part of the JISC- and NSF-funded Libraries in the Classroom Programme, a “Tools Focus Study Final Report” identified and documented the software tools being used and developed within the projects so that the sharing of tools across the projects in the program could be facilitated.
30 http://www.cdlib.org/inside/projects/amwest

http://digitalresourcestudy.berkeley.edu
Some are national in scale. (Links to and descriptions of many of the existing programs can be found at the UC General Education Commission website.\textsuperscript{31})

One example of an institutional initiative is the Shared Pedagogical Initiative: A Database of Electronic Resources for the University of California Community (SPIDER).\textsuperscript{32} The project has experimented with the integration of resources for teaching writing and research to undergraduates. Modeled after a virtual pedagogical seminar, the project has a searchable database of modular and peer-reviewed instructional and educational materials for instructors and students. Elizabeth Losh, the writing director for the UC Irvine Humanities Core Course and SPIDER team member, is consulting on our project. She and her colleagues report that with SPIDER, students are doing more research, using more resources at the library, and producing better quality writing. Another notable program is Mellon’s 2004 Librarian/Faculty Fellowship on Undergraduate Research at UC Berkeley.\textsuperscript{33} It aspires “to create a program that encourages and facilitates faculty collaboration with the library and other partners to build undergraduate knowledge of information resources; enhance student research and information competencies; connect faculty research more effectively with classroom teaching; and provide extended opportunities for faculty to mentor creative student discovery and research both within and beyond the classroom.”

An example of a national initiative is the Reinvention Center at Stony Brook University, which focuses on undergraduate education at research universities.\textsuperscript{34} Among its work is the sponsorship of various conferences including those on the integration of research and education. It has a new initiative to sponsor forums focusing on undergraduate scholarship in the humanities.

The Carnegie Foundation for the Advancement of Teaching has a number of ongoing projects relevant to the improvement of undergraduate education. These include Initiatives in Liberal Education (ILE), the Integrative Learning Project, the Carnegie Academy for the Scholarship of Teaching and Learning (CASTL), and the Knowledge Media Laboratory (KML), which “develops tools and resources to exchange information, share knowledge and produce innovations that can transform teaching and learning at many levels.”\textsuperscript{35} The Association of American Colleges and Universities’ (AAC&U) “Greater Expectations” report (Ramaley et al., 2004) evaluates the state of undergraduate general education. AAC&U has numerous other initiatives in general and liberal arts education.\textsuperscript{36}

The AAU report “Reinvigorating the Humanities” (2004) makes recommendations for improving undergraduate teaching and also describes a variety of outreach innovations taking place between universities and K–12.

The National Institute for Technology and Liberal Education (NITLE) “serves as a catalyst for innovation and collaboration for national liberal arts colleges as they seek to make effective use of technology for teaching, learning, scholarship, and information management.”\textsuperscript{37} A major goal

\textsuperscript{31} http://cshe.berkeley.edu/gec
\textsuperscript{32} http://eee.uci.edu/programs/spider
\textsuperscript{33} http://library.berkeley.edu/Staff/MellonProject
\textsuperscript{34} http://www.sunysb.edu/Reinventioncenter
\textsuperscript{35} Links to these initiatives can be found at: http://www.carnegiefoundation.org/ourwork.
\textsuperscript{36} http://www.aacu.org/issues/generaleducation
\textsuperscript{37} http://www.nitle.org

http://digitalresourcestudy.berkeley.edu
is to facilitate the development of dynamic curricula that are responsive to innovations in information technology.

The Associated Colleges of the Midwest (ACM) received a grant from the Mellon Foundation to better understand student experiences with their liberal arts education (freshman year experiences, capstone experiences, etc.). This project mainly involves liberal arts colleges and the University of Chicago, and is described in “Engaging Today’s Students with the Liberal Arts” (2005).

**Information literacy projects:** There is significant attention focused on “information literacy” projects, in which students and instructors are the primary audience. They are too numerous to review here, and are often closely linked to the above Undergraduate Education Improvement Initiatives. The Association of College and Research Libraries has developed Information Literacy Competency Standards for Higher Education. The A.W. Mellon Foundation has funded a multi-year collaborative project between Connecticut College, Wesleyan University, and Trinity College for librarians and faculty to develop and host information literacy workshops for other faculty and administrators, and to build a collaborative database for sharing information literacy learning modules and teaching resources. The Committee on Information Technology Literacy (1999) published a major National Academy of Sciences report on the effective use of information technology among college students. And more recently, Tobin (2004) has presented a review of “Best Practices for Online Information-Literacy Courses.”

**Developing effective tools for instructional use of digital resources:** The integration of diverse digital resources into teaching practice, especially the integration of library resources with learning management systems, is seen as a pressing problem (McLean and Lynch, 2003; Flecker and McLean, 2004). We are struck by the many parallel tool development initiatives taking place throughout higher education, both domestically and internationally. We suspect most users are similarly confounded by the many options available or under development.

Minielli and Ferris (2005) provide a description and literature review of the use of course management systems (CMS) in higher education. There is a significant effort toward the development of open-source software tools to support teaching (e.g., Open Knowledge Initiative at MIT). The Sakai project is a consortium of universities developing open-source, standards-based, and extensible collaborative learning environments. Rather than focusing on open courseware applications, Sakai is designed to compete with for-profit course management systems, and includes a suite of CMS tools. The open online educational resource space includes MIT OCW software and content development efforts; eduCommons at Utah State University, Rhaptos from Rice University’s Connexions project, and Melete, which is part of the ETUDES project at the Foothill De Anza Community College District.

The LionShare P2P project, based at Penn State University, is an effort to facilitate legitimate file sharing using Peer to Peer (P2P) technology for the easy exchange of image collections, video

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38 http://www.ala.org/acrl/ilcomstan.html
39 http://camel2.conncoll.edu/is/infolit
40 http://www.okiproject.org
41 http://www.sakaiproject.org

http://digitalresourcetestudy.berkeley.edu
archives, large data collections, and other types of academic information. LionShare is open source and should ultimately provide users with resources for organizing, storing, and retrieving digital files.

Brogan (2005) reviews tools specifically for humanities scholars, including NITLE Semantic Engine, designed to access and organize unstructured digital text; the NORA project, which is developing software for discovery, visualization, and exploration across large full-text collections; and the DLF Aquifer project, which is developing a testbed of library tools and services for aggregation and distribution of content.

The 2005 Summit on Digital Tools for the Humanities brought together scholars to “assess the state of development of digital tools for humanities research, as well as the effectiveness of the supporting and integrating cyberinfrastructure.” Funded by NSF and hosted at the Institute for Advanced Technology in the Humanities (IATH), the summit will result in a final report.

The management, preservation, and dissemination of the ever-expanding digital material that higher education institutions create in the research and teaching realms is a current challenge. According to Lynch and Lippincott (2005) and Westrienen and Lynch (2005), a large number of institutions they surveyed in the U.S. and abroad have developed or will develop institutional repositories (IR). They note that IRs are becoming well established as campus infrastructure components. As broadly construed, and apparently as understood by those surveyed in the above studies, an IR should house not just e-prints, but datasets, video, learning objects, software, theses, and other materials.

In an article on the emerging need for supporting personal collections, Beagrie (2005) points to the variety of commercial and non-commercial products emerging that support the increasing need of people to capture and store personal digital information, including emails, documents, articles, portfolios, and digital images, video and audio. Examples of software and services include MyLifeBits, Lifeblog, Data Deposit Box, and Ourmedia. As he notes, processing, storage, and software tools available to individuals are increasing in power, volume, and ease of use, and will provide new ways in which individuals can create, manage and disseminate a diverse range of media types.

Given this brief background, we focus below on those robust studies that specifically attempt to understand users of digital resources.

43 http://lionshare.its.psu.edu/main
45 http://www.iath.virginia.edu/dtsummit
46 DSpace, which was developed at MIT, is perhaps the best-known example. The Portico project (http://www.portico.org) provides a new model for a sustainable electronic-archiving. Its mission is to preserve scholarly literature published in electronic form and to ensure that these materials remain accessible to future scholars, researchers, and students.
48 See also Firefox Scholar, a plug-in to the Firefox browser, under development at GMU (http://chnm.gmu.edu/tools/firefoxscholar). It promises to organize citations on the desktop by “automatically capturing” author, title, all that info that scholars want to save.” (Young, 2005).
2. Specific research on digital resource users

Quite simply, existing user research is as diverse as the resources available for study and the motivations for understanding users. As a result, there is no single, uniform approach that can be gleaned from these available studies.\(^{49}\) For example, and described in more detail below, there is a relative hodgepodge of excellent studies that are germane to the improvement of targeted projects (e.g., Perseus, MOAC, Alexandria Digital Library\(^{50}\), MIT OCW, Carnegie Mellon’s Online Learning Initiative) or reflect broad surveys of librarians and library users in academic settings. Electronic journal and library use studies may be the most abundant. In addition to studies such as Troll Covey (2002), which specifically addressed the types of methods for use and usability of digital library resource collections, there are library studies that, for example, have looked at data mining (e.g., Mento and Rapple, 2003). Meta-research projects, which compile and analyze findings from multiple user studies, offer valuable insights but are limited in number and scope, and each study has its own limitations in the context of our project.

We have organized existing user studies into four primary areas: (1) electronic resource/digital library use studies, (2) cultural heritage research, (3) evaluations of specific sites, and (4) image services. We also identify a fifth emerging area, complex media environments, for which, to our knowledge, robust user studies \textit{per se} are not yet available. These rich media environments include N-way video, Global Information Systems (GIS), virtual reality, simulations, and games. As mentioned above, there is a burgeoning literature on educational technology assessment and evaluation in general. There is also a smaller literature focused on the question of cost effectiveness of educational technologies in various academic environments. Neither of these areas will be covered in detail here.

\textbf{Electronic resource and digital library use studies:} Perhaps the most exhaustive meta-research project is a recent report from the Council on Library and Information Resources (CLIR) (Tenopir, 2003). The research summarizes findings about the use and preferences for print and electronic services in academic libraries, drawing from 200 different studies published between 1995 and 2003. The report concludes that, overall, experts in different disciplines have different usage patterns of digital resources, and that students and faculty alike are more likely to adopt electronic resources if they are convenient, relevant, and save time. This valuable study however, is too “library-centric” for our purposes and does not include research about the use of text or non-text resources developed outside of library contexts.

Ithaka\(^{51}\) and the Andrew W. Mellon Foundation recently completed a second survey of faculty at four-year U.S. higher education institutions to learn about use of electronic resources. More than 7,000 faculty members responded to the survey. Among the published findings is the fact that even though faculty rely on electronic resources, they still see barriers to use. Differences

\(^{49}\) Khoo and Ribes (2005) noted the “diverse range of research methods” used by participants in a workshop focused on creating a dialogue among researchers involved in qualitative analysis of digital library users. The Cultural Content Forum (http://www.culturalcontentforum.org) made an initial foray into solving this problem for cultural-heritage institutions (Alice Grant Consulting, 2003).

\(^{50}\) http://www.alexandria.ucsb.edu

\(^{51}\) http://www.ithaka.org
among disciplines on various measures of use and satisfaction have also emerged (Kiernan, 2004; Schonfeld and Guthrie, 2004\(^{52}\)).

The Institute of Museum and Library Services (IMLS)\(^ {53}\) has funded a major Online Computer Library Center (OCLC) study of electronic research titled, “Sense-Making the Information Confluence.” The project’s goals are to understand the hows and whys of electronic resource use (Dervin et al., 2004).

Brockman et al. (2001) developed user-based criteria for guiding digital library development by studying what scholars do in research and writing. They conceptualize the type of information environment that would best support humanists’ activities and make recommendations on how information environments can be developed in such a way as to be responsive to the context of scholarly work. In the preface, Dan Greenstein emphasizes that the study provides a variety of lessons, including developing collections that “support specific research aims and thus are formed in close consultation with the scholars who share these aims.”

The EPIC Online Use and Costs Evaluation Project at Columbia University found that a wide variety of electronic resources is used regularly by faculty and students for research, teaching, coursework, communicating with colleagues, or just looking up general information related to their academic work (Electronic Publishing Initiative at Columbia, 2005). When teaching, “faculty often ‘surf’ to see what information is available both in online databases and in other Internet sources to help demonstrate ideas, give a current context to the lecture material, or find a scientific database that can be used in class.” Electronic resources are seen as providing increased convenience and increased access to information. Disadvantages included sorting through good and bad sources, and just having too much information available to sort through.

Foster and Gibbons (2005) focused on understanding “the apparent misalignment between the benefits and services of the DSpace institutional repository (IR) with the actual needs and desires of faculty.” Their work entailed interviews and observing how University of Rochester faculty members interact with digital tools and how they organize work in their virtual and physical workspaces. Their findings resulted in a redesign and better alignment of the repository with how faculty work. The findings also resulted in a rethinking of how to explain and promote the local IR.

The “E-journal User (EJUST) Survey” at Stanford (Keller, 2002) was not focused on applications in the teaching contexts. Among its findings, however, was that e-journals improve the efficiency of scientific scholarship. Electronic search engines and online access to abstracts and full-text articles speed up the process of searching and retrieving relevant scholarly content. Another conclusion was that e-journals facilitate new forms of scholarly practice through new relationships to information, knowledge, and peers.

**Cultural heritage research:** Museums and other cultural heritage institutions, which have a unique and successful history of balancing curatorial demands with public education, are a burgeoning area of user research. These studies often overlap with the digital library sector. As an example, there are a number of relevant papers in the proceedings from the Fifth Annual Conference on Libraries and Museums in the Digital World (2004). Hamma (2004), for instance,

\(^{52}\) *JSTOR, a History* (Schonfeld, 2003), presents a detailed analysis of JSTOR, a success story that can be measured by its widespread use.

\(^{53}\) http://www.imls.gov
describes user research at the Getty Museum that resulted in a redesign and rethinking of that institution’s site to meet the needs of three different types of user profiles.

The Cultural Content Forum,\textsuperscript{54} based in the U.K., commissioned research to identify, analyze, and disseminate material related to the evaluation of digital cultural heritage resources (Alice Grant Consulting, 2003). The 2003 report attempted, through a survey of cultural heritage institutions, to analyze multiple user studies. Its primary goal was to seek an intersection of metrics used across common sites. It also developed user-profile characteristics that could help generate a standardized profiling approach. The work promised further exploration of two areas: (1) the identification and definition of metrics and measurements used in evaluation projects, and (2) the identification and definition of a range of user profiles for use in evaluation work and for establishing methodologies to facilitate comparison across projects and domains. We have not had luck in following up with this group, however, and assume the project is no longer active.

Zorich (2002) conducted a survey of North American–based digital cultural heritage initiatives (DCHIs). The purpose of the survey was to identify the scope, financing, organizational structure, and sustainability of DCHIs. With reference to users, she notes that many DCHIs began their activities with no knowledge of levels of user interest and needs. “Many projects found their usage was much less than anticipated. Even now, most DCHIs feel that no one really understands what users want, despite a recent increase in studies of user needs.”

A nationwide 2006 survey by the Institute of Museum and Library Studies of 947 libraries, museums, and archives concluded, “Three-quarters or more of institutions in all groups do not conduct assessments of user or visitor needs.... Almost one-fourth of state library administrative agencies do assessments, which is the highest level among all the groups.” (The Institute of Museum and Library Studies, 2006)

In the process of creating a guide to business planning aimed at cultural heritage institutions, Bishoff and Allen (2004) conducted a survey of thirteen institutions. They concluded that these institutions had varying levels of experience with market research, needs assessment, and outcomes assessment. They also concluded that, when compared to libraries, museums must have a good understanding of their markets to develop strategies to maintain or increase gate receipts, an essential source of revenue. Museums therefore tend to break down their “visitors” into several categories.

**Site-specific user studies:** Marchionini (2000; Perseus), Gilliland-Swatland (1998; MOAC), Borgman \textit{et al.} (2001; Alexandria Digital Library), Hill \textit{et al.} (1997; Alexandria Digital Library), and Carson (2004; MIT OpenCourseWare) are excellent examples of rigorous “product testing” user studies that employ a multiple-data collection strategy or “portfolio” approach. All of these studies, to some degree, have employed a combination of surveys, discussion groups, follow-up interviews, and transaction log analysis (TLA) to get a broad look at site-specific user and developer behavior. This technique is apparently relatively new to the library world, although it has been used on educational sites for some time (e.g., Harley \textit{et al.}, 2002 and other CEUTT studies\textsuperscript{55}). Carnegie Mellon University’s Online Learning Initiative (OLI) is conducting several studies that combine an understanding of student learning with the implementation of

\textsuperscript{54} http://www.culturalcontentforum.org

\textsuperscript{55} http://www.ceutt.org
stand-alone online courses. They are using a variety of methods including student demographic information as well as perception and attitudes (through entry, exit, and embedded surveys), instructor information (through casebooks, surveys, and workshop feedback), usability studies, effectiveness studies, evaluation of student achievement, and spontaneous unsolicited feedback.

Triangulation of multiple methods in these studies contributed to the ongoing redesign of the sites for multiple audiences. They also set an emerging standard for methods necessary to an understanding of users, and to evaluating digital resources in complex educational environments. In all cases, a major goal has been the integration of the sites into teaching/learning environments. These studies, taken together, may point the way toward assessing the value of user studies for the user of specific resources.

**Image service studies:** Art history, a field that has depended heavily on slide libraries for teaching, is a fertile area for the integration of digital imaging. Small case studies suggest significant pedagogical and cost-savings potential for art history faculty (e.g., Burnett et al., 2002).

Penn State’s *Visual Image User Study* (Pisciotta et al., 2002) is an excellent internal study and needs assessment of image services that, in addition to assessing that campus’ climate and needs, pointed to the limitations of current software, as well as the importance of faculty personal digital collections and resources.

The Research Libraries Group (RLG) is currently involved in various activities to make their cultural materials more amenable to classroom use. RLG has conducted interviews with faculty to probe how they use digital images now, the barriers they encounter, and what they would like to see happen in an ideal world. Among their findings are that faculty use their own materials, rely on PowerPoint for presentation, and are not dependent on aggregated digital collections such as RLG (and may not know about them). The importance of the Google search model is clear, and in a perfect world, the idea of searching across all licensed resources and the web at the same time found many proponents (Waibel, 2004).

The California Digital Library (CDL), one of our partners and with whom we have consulted, conducted an internal assessment of its image demonstrator service, which uses Luna Insight technology (Farley, 2004). The results of their internal evaluation mirror those of Penn State, RLG, and our own findings. Faculty use of personal digital resources is important, and effective tools to manage these resources and reuse them in new contexts need to be developed.

ARTstor is currently conducting an ongoing internal evaluation of their own collection and services. Like other sites, ARTstor has found that ease of use and reusability are primary concerns among users (OER Meeting, 2005). In addition to needs assessments that help the organization make critical decisions about resource investment, a formal survey found that while there appeared to be a greater overall dependence upon digital resources, disciplinary differences were apparent in attitudes of faculty toward and use of digital resources (Shonfeld 2006).

56 http://www.cmu.edu/oli/research/index.html
57 Personal communication with Candace Thille, Director of OLI.
58 http://www.rlg.org
59 Also personal conversation with RLG staff members Merrilee Proffitt and Günter Waibel.
60 http://www.cdlib.org

http://digitalresourcestudy.berkeley.edu
and Guthrie, 2004). These early findings suggest that the development of tools and services may need to be customized for specific disciplinary needs.61

3. Complex new media (interactive video, GIS, 3D applications, games, social software)

It is generally agreed that humanists and social scientists will depend on complex media tools to realize the full potential of digital resources in their teaching and research (ACLS Commission, 2005; HASTAC, 200462), though this has not yet been fully realized (Ayers, 2003). The potential emergence of robust applications employing GIS, N-way video63, and virtual reality may finally offer tangible opportunities for those in the humanities and social sciences who want to integrate such technology into their scholarly and pedagogical practice. The embryonic and fragile nature of some of these technologies in real teaching and learning contexts, however, has kept them out of the hands of anyone but those with the most funding and guts, so there are few significant data on their use in undergraduate educational contexts.

Ayers, who has been instrumental in developing innovative approaches to digital scholarship, has been a champion of rethinking how the online environment can go beyond the simple contextualization of knowledge to a space for nonlinear teaching and learning. Specifically in his work with the Institute for Advanced Technology in the Humanities (IATH) and the Valley of the Shadow project64, he has demonstrated how the basic IT infrastructure can be harnessed to support unique ways of content development and creative reuse (Ayers 2003, 2004).

More robust applications of virtual reality are being developed and utilized, such as the Cultural Virtual Reality Lab, which recreates the Roman forums, and MIDA (Mellon International Dunhuang Archives), which allows scholars to view Chinese cave paintings in 3D using virtual reality technology (cited in ACLS Commission, 2005). And, we are seeing more interest in applications which rely on spatial data, such as ECAI (Electronic Cultural Atlas Initiative).65

Since we embarked on this report, many discussions have emerged around social-media applications in support of scholarship (if not always H/SS focused). Various genres of “social computing/software” in particular have garnered an exceptional amount of attention66. Social software and social computing as they are broadly discussed in the popular press cover a wide variety of applications, activities, and projects, including blogs, wikis, audio and video remix, podcasting, MySpace, Facebook, Wikipedia, del.icio.us, and Flickr, to name just a few.67 Much of the enthusiasm is generated by interest in social-network theory, and the ability of users to

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61 ARTstor is undertaking further qualitative investigations to better understand the kinds of organizational structures and local support necessary (Personal conversation with Ithaka staff member Roger Shonfeld, November 28, 2005).

62 The vision statement of HASTAC (Humanities, Arts, Science, Technology Advanced Collaboratory), which was founded by a number of national humanities centers, supercomputing centers and other entities, lays out a vision for collaborative possibilities in e-humanities (http://www.hastac.org).

63 Kaufmann (2005) describes the importance of video and television for education and envisions a future of open production.

64 http://valley.vcdh.virginia.edu


66 See, for example, http://www.web2con.com


http://digitalresourcestudy.berkeley.edu
create and share social tags (keywords) on any and all web content without regard to rigid centralized categorical constraints (Flickr and del.icio.us being the most notable examples). Examples of podcasting of lectures and other audio, and the use of blogs and wikis in writing courses can be found in any publication focusing on technology in higher education. Wikipedia, as described on its website, is a “multi-lingual Web-based free-content encyclopedia. It is written collaboratively by volunteers, allowing articles to be added or changed by anyone with an Internet connection.” It is of particular note because its distributed authoring model has been hailed by enthusiasts as the model for creating everything from electronic college textbooks to scholarly publications. The degree to which such a model can ensure high quality and avoid misinformation is very much under debate, however (Siegenthaler, 2005). Experimentation with these types of technologies in pedagogical contexts abounds and will surely increase.

There has also been significant attention focused on how games and simulations might be used for educational purposes (including MMORPGs, Massively Multiplayer Online Role-Playing Games). Proponents argue that games have the potential to teach higher order thinking skills as well as encourage adaptation to continuously changing environments (e.g., Kelly, 2005, and NESTA Futurelab, 2005). Kelly specifically suggests that while games cannot replace traditional forms of teaching or teachers, they can offer similar functions as one-on-one tutors without the drain on teacher time. John Seely Brown (2005) further argues that in specific interest communities, including online role-playing games, the range of “users” from novices to experts and the interactions that occur enable a kind of peer modeling or informal apprenticing that teaches not only actual skills but situational knowledge as well: the culture, sensibilities, and aesthetics—or epistemological framework—that make up that profession or role.68 For educational games to be widely used in teaching, Kelly (2005) argues that significant funding for research and development of tools, standards, infrastructure for data collection, and evaluation of effectiveness is necessary, especially in the area of “serious games” or games that incorporate real educational skills in order for the player to advance. Gee (2005), however, suggests that many commercial games are already based on good theories of learning.

The new generation of students that higher education can expect to welcome is variously known as the Net Generation, ikids, and the “always on” generation. They depend upon and expect convenience and easy access to information, and often find linear learning unfamiliar and difficult (Ayers, 2003, Oblinger and Oblinger, 2005). A UC Berkeley and USC Annenberg Center project funded by the MacArthur Foundation has just begun an ethnographic study to investigate the broad outlines of how kids are using various types of new media in informal learning contexts 69

It is expected that these students will be characterized by their facility with mobile devices and their willingness and interest in creating digital content through blogs, social tagging, remixing audio, etc. Many expect the emergence and evolution of new mobile devices such as phones and iPods (Lenhart and Madden, 2005; Ito et al., 2005), which allow access to unlimited information in a pocket and enable communication via text, video and audio, to have profound effects on learning. The recent ECAR report (Kvavik and Caruso, 2005), however, suggests that current college students may have fewer demands for technology on the higher education

68 Also see http://www.johnseelybrown.com/learning_in_digital_age-aspen.pdf
69 “Kids’ Informal Learning with Digital Media.”; http://groups.sims.berkeley.edu/digitalyouth;
landscape than previously expected. It is unclear whether the student desire for “moderate”
technology in learning may change as the younger generation enters higher education.

In summary, we can continue to say with confidence that there has been no coordinated
conversation about the “why” and “how” of user studies that could apply across the many
types of digital resources and their sources. This is in large part related to (1) the relatively
recent availability of multiple, well-developed digital resources, (2) the great diversity of digital
resource types that has emerged, (3) the significant costs of well-designed user research, (4) the
multitude of user types, potential educational contexts, and motivations for studying use, and
(5) the evolving (moving target) nature of the digital resources themselves. The latter has
required that evaluators focus both on “product testing” paradigms and on research that
analyzes the “interactions of complex phenomena” (Marchionini, 2000).

C. Developing a typology — but from whose perspective?

Any attempt at describing the universe of faculty use of digital resources demands some
common vocabulary. But there are challenges to the construction of such a vocabulary, not least
of which is that digital resources of all kinds are proliferating in many different environments
and are created by many different kinds of developers. The confusion can be seen in three
areas:

- Defining any collection of digital resources is complicated by whose perspective you
  take.
- Different users may view and value the digital resources available to them differently
  from one another and differently from those who create and manage digital resources.
- The varied proprietors of digital resources have different views and roles, and may
  value resources and collections differently.

Based on discussion with a Site Owners Advisory Group, our faculty discussion groups, and
interviews of and a meeting with digital resource providers, it is clear that the array of available
digital resources may represent different things to different types of owners and users. Clearly,
the perspective of users and owners is quite different both among them and between them. For
example, what we might describe and label as a collection has little meaning to the typical user.
Many users are not particularly interested in the word “collection” unless it represents a tightly
focused collection around a specific topic or topics (e.g., the Jack London Collection70).

Therefore, the word collection, as used in the digital library world, may be problematic both in
understanding users and in constructing a map of the universe of “stuff” users want to access.
In our project’s context, which has been to ascertain what people use and not to tell them what
particular resources are valuable, the issue of how to define digital collection frequently arose.
We concluded that, while collection owners may indeed care about collections, individual users
probably do not. Users often have a different level of granularity that categorizes their
definition (e.g., whether they can find on the web a format, a photo, a picture, or a passage). For
users, the information needed is frequently a small slice of a larger digital collection. We
discuss the issue of different perspectives in some detail below.

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70 http://sunsite.berkeley.edu/London
1. The user perspective

Faculty (and others) have various types of digital resources from which to choose for teaching, depending on their needs. As mentioned previously, the resources faculty draw from include their own resources, department resources, local library resource collections, licensed resource collections, and of course, what is available through Google and similar search engines. To complicate matters further, there is no single type of academic user, nor do users see the world in the categories constructed by researchers and librarians. For example, users simply want the right object at the right time. That object might be mined from a traditional collection or it might be found in any number of spaces—not infrequently, as the result of a Google-type search. The types of users who access these resources are also diverse. They range from K–12 teachers and students to research scholars to undergraduate educators in vastly different types of institutions to the general public. Furthermore, these categories of users often comprise diverse individuals with varying and idiosyncratic needs, perceptions, and ways of finding and utilizing digital resources.

2. The site “owner” perspective

One attendee at the Site Owners’ Advisory Meeting mentioned above aptly pointed out that the terms “owners” or “collection developers and owners” recurred as though they described a single group. In reality, though, there is often a more complicated set of roles under the designation “owner,” and the individuals in those roles ordinarily have different interests, values, and, especially, different levels of access to traces of user behavior. He suggested the following distinction between these roles:

- Aggregators, who select which digital resources are to be available in what combinations, and try to bring them to the attention of users (e.g., someone at Berkeley choosing which resources should be combined in a meta-search service, or someone assembling a portal, or RLG in their role of assembling the Cultural Materials service and promoting it, or Google)

- Developers of tools, who shape user interactions, export mechanisms, and access paths. This role includes both searching within stand-alone digital resources and making digital resources available for federation or crawling or other forms of discovery (e.g., developers at Luna in their role of developing Insight, or those developers involved in ARTstor in their role of developing a browser-based client and Offline Image Viewer, or Blackboard, or RLG in their role of defining and developing functionality and export for Cultural Materials, or Endeavor)

- Content creators/owners, who conceive, assemble, describe, and digitize content (e.g., the site development team comprising a programmer at one institution and a content developer at another, who both contribute to site development).

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71 Results from our faculty survey and discussions.
72 Arnold Arcolio of RLG contributed the ideas about multi-faceted owner roles at the May 17th, 2004, Site Owner Advisory Meeting.
3. Typology development

To describe the complex and diverse world of digital resources, we began by constructing a simple typology in spring 2004. We leveraged findings from our fall 2003 faculty discussion group sessions and drew from existing research (Brogan, 2003) to develop our initial framework. We began with one primary dimension based on types of resources that were mentioned by faculty and from our background research of existing resources (e.g., ancient manuscripts, image databases, online journals, etc.). The resulting classification is shown in Table 1.1, below. We knew before we started that there is often significant overlap among potential types. For example, what features distinguish a “digital archive” such as MOAC from a broader “non-library/non-museum” resource such as Perseus? How does a set of archived course videos differ from the online course materials being mounted in MIT OCW or the learning objects of MERLOT?

Table 1.1: Typology of digital resource landscape

<table>
<thead>
<tr>
<th>Types of resources</th>
<th>Sources of resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images or visual materials (drawings, photographs, art, posters, etc.)</td>
<td>Search engines/directories (e.g., Google, Yahoo)</td>
</tr>
<tr>
<td>Maps</td>
<td>Personal collection of digital materials</td>
</tr>
<tr>
<td>Simulations or animations</td>
<td>Public (free) online image databases</td>
</tr>
<tr>
<td>Digital film or video</td>
<td>Commercial image databases (e.g., Saskia, AMICO74)</td>
</tr>
<tr>
<td>Audio materials (speeches, interviews, music, oral histories, etc.)</td>
<td>Campus image databases from one’s own institution (e.g., departmental digital slide library)</td>
</tr>
<tr>
<td>Digital facsimiles of ancient or historical manuscripts</td>
<td>“Portals” that provide links or URLs relevant to particular disciplinary topics</td>
</tr>
<tr>
<td>Online or digitized documents (including translations)</td>
<td>Online exhibits (e.g., from museums)</td>
</tr>
<tr>
<td>Government documents</td>
<td>Library resource collections (i.e., digital)</td>
</tr>
<tr>
<td>Data archives (numeric databases; e.g., census data)</td>
<td>Online journals (e.g., JSTOR)</td>
</tr>
<tr>
<td>News or other media sources and archives</td>
<td>Media sites (e.g., NPR, New York Times, CNN, PBS)</td>
</tr>
<tr>
<td>Online reference resources (e.g., dictionaries)</td>
<td>Other sources of digital resource</td>
</tr>
<tr>
<td>“Portals” that provide links or URLs relevant to particular disciplinary topics</td>
<td></td>
</tr>
<tr>
<td>Personal online diaries (e.g., weblogs)</td>
<td></td>
</tr>
<tr>
<td>Online class discussions (including archived discussions)</td>
<td></td>
</tr>
<tr>
<td>Curricular materials and websites that are created by other faculty or other institutions (e.g., MIT OpenCourseWare, World Lecture Hall, Merlot)</td>
<td></td>
</tr>
<tr>
<td>Digital readers or coursepacks</td>
<td></td>
</tr>
<tr>
<td>Interactive Media (e.g., VR, games)</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
</tr>
<tr>
<td>Other types of resources</td>
<td></td>
</tr>
</tbody>
</table>

Further complicating a typology is the need to add functional dimensions to that which is purely descriptive. In Table 1.2, below, we added both (1) a dimension of “findability,” or the sources of resources used to discover and locate digital resources (e.g., search engines, portals, online exhibits, etc.), and (2) a dimension of digital resource characteristics, or the underpinnings of digital resource origination, purpose, audience, and administration (e.g., the original


http://digitalresourcestudy.berkeley.edu
intended audience, primary or secondary integration into the classroom, university or public institution based, foundation funded, etc.).

### Table 1.2: Digital resource characteristics/digital resource provider interview focus

<table>
<thead>
<tr>
<th>Focus and goal of site</th>
<th>Management and administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope (e.g., degree of specificity — Dime Novel Collection75 vs. broad digital resource collections which may be a conglomeration of many individual sites, like Sunsite76)</td>
<td>Organizational affiliation of resource (public, private, consortium, etc.)</td>
</tr>
<tr>
<td>Diversity (how many subsites make up the main site?)</td>
<td>Ownership (single owner, group, museum staff, multi-institutional)</td>
</tr>
<tr>
<td>Overall digital resource type (anthology, online exhibit, referatory, etc.)</td>
<td>Staffing and roles (how many and in what roles, librarians, designers, scholars, etc.)</td>
</tr>
<tr>
<td>Overall size (small/large, number of pages, etc.)</td>
<td>Dissemination/Marketing (personal, institutional, registered)</td>
</tr>
<tr>
<td>Intended audience (students, instructors, scholars, etc.)</td>
<td>How long the has the site been up (persistence)</td>
</tr>
<tr>
<td>Media content (what types of media are included — images, maps, games, tutorials?)</td>
<td>Preservation and maintenance (how often the site is updated, expected lifespan)</td>
</tr>
<tr>
<td>Digital formats (form of representation, e.g., jpegs, tiffs, etc.)</td>
<td>Funding (start up and maintenance costs)</td>
</tr>
<tr>
<td>Content evaluation (what percentage of content is evaluated, e.g., refereed?)</td>
<td>Funding sources for development and sustainability (foundations, institutional support, income, none)</td>
</tr>
<tr>
<td>User access (free and unrestricted vs. password protected, etc.)</td>
<td>Understanding use</td>
</tr>
<tr>
<td>Integration intention (is the site intended to be integrated with other learning resources, CMS, bibliographies, etc.?)</td>
<td>Monitoring usage (what usage data are collected, e.g., TLA, anecdotal, surveys, etc.)</td>
</tr>
<tr>
<td>Reuse (to what extent can the content actually be reused and by whom; e.g., wrapped in lesson plan, jpeg downloaded, etc.?)</td>
<td>How frequently usage is monitored (monthly, yearly, etc.)</td>
</tr>
<tr>
<td>Technical compliance (e.g., Z39.50)</td>
<td>Percentage of budget, per year, spent monitoring use</td>
</tr>
<tr>
<td>Metadata (LC subject headings, Dublin Core, none, etc.)</td>
<td>Percentage of staff, per year, dedicated to monitoring use</td>
</tr>
<tr>
<td>Searchability (Google licensing, federated, homegrown search feature, browsing, none)</td>
<td>Applying usage data (how are usage data applied to the operation?)</td>
</tr>
<tr>
<td>Linking (external vs. internal vs. none)</td>
<td>Unknown information about use (e.g., what do you want to know that you haven’t been able to collect, or why is understanding use important?)</td>
</tr>
</tbody>
</table>

### 4. Usefulness and limitations of a typology approach

Since our initial typology was based on actual discussion group data, it provides a useful map for describing digital resources from a faculty perspective. Together, using all three dimensions (type, source, and characteristics), the typology conceivably functions as a theoretical matrix for describing the variety and complexity of unrestricted digital resources in humanities and social science undergraduate education. But, as with most typologies, which are simplifications of complex phenomena, our typology has its limitations.

In May, 2004, we asked our Site Owner Advisory Group for critiques and revisions of our typology. While the group considered our typology a realistic start to describing the digital

75 [http://sulair.stanford.edu/depts/dp/pennies](http://sulair.stanford.edu/depts/dp/pennies)
76 [http://sunsite.berkeley.edu](http://sunsite.berkeley.edu)

http://digitalresourcестudy.berkeley.edu
resource landscape, they acknowledged existing gaps and limitations to our approach. They stated a need for adding resource characteristics to our typology, including: (1) a category for users’ motivation for resource use, (2) a category for different forms of representation in resources (e.g., jpeg, tiff, and so on), (3) a category covering implications of reuse (licensed vs. unlicensed sites), and (4) a category covering the abilities of users to repurpose content from a digital resource collection for their own uses. Arnold Arcolio of RLG suggested that we modify and simplify our typology approach altogether, so that resource characteristics are gathered around “centers of value,” which appear in Table 1.3. These centers of value can function as broad yet significant guiding principles, with considerable strengths in describing all kinds of unrestricted resources (whether the resource is MOAC, Sunsite77, MIT OCW, or a homegrown site put together by an anthropology professor for classroom use).

Table 1.3: Digital resources and centers of value

- Content coverage (chronological, geographic, thematic, disciplinary, type of “original”—manuscripts, coins, maps, games)
- Form of representation (i.e., availability of digital formats and portability, e.g., jpeg, tiff, sid; proprietary or open, level of metadata: structured, standard, rich or thin; wrapper issues, e.g., HTML, XML, METS)
- Authority (e.g., source, maintenance, institutional affiliation)
- Permitted uses and digital rights of reuse
- Persistence (e.g., how long is the resource up, how often does updating occur?)
- Exposure for discovery (e.g., searching paths, browsing, availability for federated search, availability for Google crawling)

At the beginning of this study, we intended to map, through an online review, the interrelationship between the centers of value and the resource characteristics needed to fully describe them. The sites under study came from three sources: (1) those suggested to us by faculty through survey responses and discussions, (2) our own research, and (3) initiatives funded by the Mellon and Hewlett foundations. The list of sites can be found in Appendix A.

As we began to collect these data, however, two issues became apparent: 1) the sheer scope of data available made collection both time consuming and resource intensive, and 2) the data themselves were in different formats, making comparison difficult at best. We opted to forego this mapping process at the same time as it became apparent that our planned broad survey (described below) would not sufficiently answer the questions we posed.

Specifically, we thought it more valuable to tease out some of the complexities and richness of individual sites. Thus, we opted to conduct in-depth one-on-one telephone interviews with a small sample of sites in lieu of a broad survey that might only scratch the surface. Though not comprehensive of the entire digital resource universe, our interviews were able to explore the variety and the nuances of individual sites, and thus begin to raise important questions and identify areas for future investigation. Our findings are discussed in Goal 3A.

77 http://sunsite.berkeley.edu