

COLLECTION MANAGEMENT STRATEGIES IN A DIGITAL ENVIRONMENT

A Project of the Collection Management Initiative
of the
UNIVERSITY OF CALIFORNIA LIBRARIES

Final Report to the Andrew W. Mellon Foundation

by

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EXECUTIVE SUMMARY

INTRODUCTION

The goal of the Collection Management Initiative was to explore issues associated with integrating and managing research library journal collections comprising print and digital formats. The study sought to explore ways that the University of California could leverage its investment in digital library collections by providing campuses with new approaches for managing their print collections with greater flexibility, given the constraints imposed by existing facilities and limited capital funding. The specific objectives of the grant proposal were to:

- Study the behavior and attitudes of users when selected print journals for which electronic access is provided are relocated to remote storage and primary use is of the electronic version, and ascertain the variety of factors affecting the acceptability of digital publications as a substitute for the equivalent print publications.
- Design and test processes for consultation and decision-making for the selection, processing, relocation, and administrative management of print materials relocated to remote storage.
- Document the costs incurred and avoided for maintaining selected journal titles for which electronic access is provided when paper copies of the journals are relocated to storage and primary use is of the electronic version.
- Document the change in usage of digital and print versions of selected journal titles when print is relocated to storage.
- Assess the institutional implications for library organization and operations, including facilities planning, capital budgeting, systems, and resource management.
- Evaluate institutional strategies and policies for archiving of research library materials in a mixed print/digital environment.

RESEARCH COMPONENTS

The Collection Management Initiative encompassed three complementary research components. The first component, the Journal Use Study, concentrated on assessing the impact on the user community when print materials are removed from campus library collections and users must rely on digital equivalents. The second component focused on user behaviors and preferences gleaned through surveys and structured interviews. The third component was designed to gather data on the costs and benefits of removing print materials from library collections and relying on digital equivalents.

Journal Use Study

One of the critical objectives of the CMI project was to “document the change in usage of digital and print versions of selected journal titles when the print versions are relocated to storage.” In pursuit of this goal, the Journal Use Study was designed. Approximately 300 journals were selected by UC campus librarians from a universe of 3,000 eligible journals that were licensed by the California Digital Library and available in electronic form on every campus. To be eligible for the

study, each journal had to be held in print on at least two campuses and the supplier of the journal had to be able to provide usage data at the title level and by the user's campus.

For each title selected for the Journal Use Study, one print copy was relocated from the campus, called an experimental site, to remote storage. Another print copy of the journal, located on another UC campus, called the control site, remained on library shelves.¹ From October 1, 2001 to September 30, 2002, usage data were gathered for each print copy whether located in storage or on campus, as well as for the electronic version of the journal at both the experimental and control sites. Usage data for both print and digital versions are available by journal title, campus, broad subject categories (i.e., arts and humanities, physical sciences and engineering, social sciences, and health and life sciences), and by journal provider on the Collection Management Initiative Web site at <<http://www.ucop.edu/cmi/data.html>>.

In the Journal Use Study, we found that:

- There was very little demand at experimental sites for recall of the print journals from storage, and removal of these journal issues from the library shelves generated very little comment from library users. The predominant reason for requests to recall print journals from storage was incomplete content in the digital counterpart.
- Overall, we observed an average of 16 uses of the digital version of a journal for each use of the print version, at those campuses where both versions were available (control sites). Although the measure of use of a digital journal (a request to view/download an article, as reported by the supplier of the online journal) differed from the measure of print use (the reshelving of a volume or issue of the journal by library staff), this finding suggests that digital journals are used more intensively than print journals when both versions are available, a finding that was generally confirmed by the User Preference Survey (see below).
- The ratio of digital to print uses at control sites varied somewhat by discipline, with journals in the physical sciences and engineering recording a ratio of 33.5 to 1. For journals in the life sciences, social sciences, and arts and humanities, however, the ratios were very close, ranging from 9.6 to 10.4 to 1. Although titles in the arts and humanities (22 titles) and the social sciences (26 titles) comprised the minority of titles included in the study, this finding suggests that the results of the Journal Use Study may be applicable across most academic disciplines.

User Preference Survey

To fulfill the project objective to study the behavior and attitudes of users when selected print journals are relocated to remote storage and the primary use is of the electronic version, and ascertain the factors affecting the acceptability of digital publications substitutes for the equivalent print publications, the project team designed the User Preference Survey. The survey was based on the results of: face-to-face formative interviews; consultation with the various CMI advisory groups

¹ The term "experimental," as used in the CMI project, denotes the role of the campus libraries participating in the Journal Use Study's "experiment" by removing printed journals from the library shelf and asking users to rely primarily on the digital versions of those journals. The term "control" denotes the role of campus libraries that retained the same journals on their shelves and closely monitored their use during the Study. While this design provided useful comparative information on print and digital use of Study journals, the terminology should not be understood to imply that a scientifically-controlled experimental design was used. See Section 1 for a description of the methods used to select titles for the Study.

(see Appendix C); a pre-test of the survey; and advice from the UC Santa Barbara Social Sciences Survey Center (<<http://www.survey.ucsb.edu/>>), which administered the final survey. The survey was administered during the winter and spring of 2003. Invitations were sent to 20,000 individuals selected at random from faculty, graduate students, undergraduate students, staff, and health professionals. More than 7,000 individuals (over 35 percent) responded with completed surveys.

In the User Preference Survey, we found that:

- Electronic journals are popular, extensively used, and pervasive. Overall, more survey respondents: a) had used a digital journal in the week prior to the survey than had used a print journal; b) said that all or some of the key journals in their fields were available electronically; c) said that research in their field depended on electronic journals; d) preferred electronic journals to their print counterparts for a variety of common tasks; e) overwhelmingly (96 percent) valued the fact that electronic journals are available around the clock and without traveling to the library; and f) agreed that electronic journals were a suitable alternative to print (82 percent). Undergraduate students, however, were among the least intensive users of electronic journals.
- Notwithstanding this finding, respondents said that journals in print format remain critical to scholarship and teaching. In fact, there were not strong divisions between preference for and use of print and of digital formats. Recent use of electronic journals was highly correlated with recent use of print, suggesting that academic users of journals will seek out the information they need in whatever format it is most conveniently available.
- Even though the findings show that electronic journals have been received enthusiastically, respondents identified a number of barriers to their effective use. The most important of these was the unavailability of older issues in electronic form: 92 percent of faculty and graduate students, and 76 percent of respondents overall, identified this as a problem. Other significant problems identified by respondents included reading on the computer screen, highlighting or making notes in articles, and access to the library's electronic journals from off-campus locations.
- There were some statistically important disciplinary differences in these responses; where these existed, the tendency was for respondents in the arts and humanities to view electronic journals less favorably, followed by the social sciences. However, these differences were not strong enough to refute the general findings.

Cost Study

To address the project objective “to document the costs incurred and avoided when print copies of journals are relocated to storage and the primary access is to the electronic version,” a cost consultant was engaged. Michael Cooper – Professor Emeritus, School of Information Management and Systems, UC Berkeley – developed a cost modeling component of the proposal and reviewed cost and use data, as well as other relevant data from UC institutional sources and published literature.

In the Cost Study, we found that:

- On a cost-per-use basis, and considering all relevant subscription, processing and storage costs, electronic journals cost less than print journals, even when libraries use a variety of cost-saving collection management strategies to reduce print costs (e.g., avoidance of binding, off-site storage). Considered in the light of the other findings of this study, it appears that libraries can achieve considerable savings by canceling print subscriptions and relying on digital when both are available, depending on the terms of their license agreements.
- However, our findings also suggest that print journals remain important to library users and that the content, usability and technological characteristics of the current generation of digital journals (and the information environment in which they exist) present barriers to their effective use for many library users. To the extent that libraries wish to ensure ongoing access to the print versions of the journals they offer in digital form (for these reasons and/or owing to concerns about the archival persistence of the digital versions), it is most cost-effective if a group of libraries can share the cost of one print subscription housed in off-site storage. The savings are substantial relative to the cost of each library maintaining dual-format subscriptions, and the evidence from the Journal Use Study suggests that, because the stored print copies will be rarely used, this strategy should have a minimal impact on the quality of library service.

OUTCOMES

The Collection Management Initiative reinforced UC's commitment to continue building digital library collections that meet the needs of its scholars and to continue exploring ways to manage its collections as effectively and efficiently as possible. The following are some of the initiatives that are reinforced by the findings of the CMI project:

- Continue to negotiate license agreements for perpetual access to digital journals that include a provision for a print copy for a shared print archive. UC is currently conducting a pilot project to receive and catalog a print copy of ACM and Elsevier journals.
- Establish an archival shared print journal collection for all electronic journals (ejournals) licensed by UC.
- Provide staffing and infrastructure to manage the shared print journal collection systemwide and at the campus level, including an Associate University Librarian for Shared Print and a collaborative tools to support the joint management of print subscriptions and digital license agreements.
- Develop a systemwide service plan to support shared collections whether in digital or print format.
- Identify methods to preserve and persistently manage ejournals licensed by UC.
- Redefine the role of UC's regional storage facilities to accommodate the storage and preservation of shared print collections.

1. BACKGROUND AND CONTEXT

1.1. RATIONALE FOR PARTICIPATING IN THE COLLECTION MANAGEMENT INITIATIVE

In January 2001, the Andrew W. Mellon Foundation awarded the University of California a \$670,000 research grant for a two-year study to explore how scholars and libraries could best integrate and preserve collections of scholarly journals published in both print and digital formats. The project was known as the Collection Management Initiative (CMI). Prior to the awarding of the grant, the Foundation expressed an interest in supporting experiments that would test aspects of managing research libraries that increasingly consisted of a mix of print and digital materials.

Like other research universities, UC has a strong interest in better managing its existing library facilities to accommodate continually growing collections. In addition, due to the pressures within California, including significant enrollment growth and the need to address urgent seismic safety deficiencies and replace deteriorating campus infrastructure, UC's libraries are faced with competing demands for capital funding. One way to meet these demands is to use digital technologies to assist in managing library collections, for example, by withdrawing print versions from the shelves when electronic access is available for equivalent content. In this way, UC could leverage its considerable investment in digital library collections by providing its campus libraries greater flexibility in managing their print library collections.

UC's extensive digital and print journal holdings formed the basis for the research proposed in the CMI project. The California Digital Library (CDL) had been established in 1997 to build UC's digital library, assist campus libraries with sharing resources more effectively, and provide leadership in the application of technology to the development of library collections and services. By 2001, the CDL had licensed a shared collection of nearly 6,000 electronic journals from approximately 20 publishers. Most of the ejournal titles held in the University's shared digital journal collection were in the physical sciences, engineering, and life and health sciences. An estimated 20 percent of the ejournals accessible to UC at that time were in the social sciences, arts, and humanities.

The design of the CMI project relied not just on the depth of the digital journal holdings but also on the redundancy of print journal holdings among the campuses. It was estimated, for example, that for each electronic journal licensed by the CDL, an average of four print subscriptions were held by campus libraries. Additionally, Melvyl, the University's union online catalog, provided an essential bibliographic tool for verifying print journal holdings on each campus, selecting journals for the study, and classifying selected journals by subject.

For more than two decades, two remote storage facilities, one in northern California and one in southern California, have been available for use by campus libraries to store little-used materials. To minimize the time it takes to transport library materials from one campus to another and from storage facilities to campuses, UC uses an overnight courier service. The regional library facilities provide either photocopies or telecopies (by fax or Ariel) of journal articles to library users on request. The Southern Regional Library Facility, a high-density shelving facility located on the UCLA campus, stored journals selected for the CMI study by the UC campuses in the south. The Northern Regional Library Facility, located in Richmond, was used by two campuses in the north to store journals.

1.2. HISTORY OF LIBRARY COLLABORATION AT THE UNIVERSITY OF CALIFORNIA

To understand the rationale for participating in a systemwide, collaborative research project, it is important to have some knowledge of the history of library planning at the University of California. The University of California consists of nine campuses² under a single governing board, with an operating budget of almost \$14 billion, more than 197,000 students, and 150,000 faculty and staff. Each of the nine campuses is a major teaching and research institution in its own right, and each hosts a world-class research library. Collectively, the UC Libraries hold almost 33 million volumes, receive almost 340,000 current serials, and have acquired millions of manuscripts, maps, recordings, government documents, and other materials essential to support leading-edge research.³

Since the mid-1970's, library planning for the University of California has been guided by the principle that the library holdings of all campuses should be considered a single University collection rather than as separate collections. The 1977 report of UC's Office of Universitywide Library Planning, known as the Salmon Plan,⁴ articulated the concept of "One University, One Library," a principle that informed all subsequent planning efforts for the UC libraries, including development of an online union catalog, a shared collection development and acquisitions program, the building of two regional storage facilities, and an intercampus resource sharing program.

In the fall of 1996, the University undertook a second major planning effort known as the Library Planning and Action Initiative (LPAI) under the leadership of a task group comprising faculty, Vice Chancellors, other academic administrators, and University Librarians. Their final report⁵ laid out future strategies for the UC libraries. The report recommended a Universitywide approach to library planning in order to maximize the information resources available through the libraries and to take advantage of emerging technologies. The Collection Management Initiative was designed in part to carry out two of the LPAI goals.

- Determine the most effective ways to exploit digital technologies to provide new opportunities and to mediate changing demands, exponential growth, and rising costs; and assess how the presence of these technologies may shift the role and scope of libraries, librarians, and library services; and
- Initiate actions and strategic projects that can both provide information critical to planning and address immediate issues faced by the University's Libraries.

The final report of the LPAI task group identified seven strategies to guide the UC libraries during their transition to the digital future. Primary among those strategies was the establishment of the California Digital Library (CDL) and the development of effective delivery systems as part of UC's resource sharing program. The establishment of the CDL encouraged effective, collaborative growth

² With the recent establishment of its Merced campus, UC now comprises ten campuses.

³ Information on the holdings and other characteristics of the UC Libraries is available at <http://www.slp.ucop.edu/stats/>.

⁴ *The University of California Libraries: A Plan for Development 1978-1988*, Berkeley, CA: University of California, Systemwide Administration, Office of the Executive Director of Universitywide Library Planning, July 1977.

⁵ *Library Planning and Action Initiative, Advisory Task Force Final Report*, University of California, March, 1998 (<http://www.lpai.ucop.edu/outcomes/finalrpt/>).

of electronic journal collections. The University's enhanced resource sharing program, notable for its patron-initiated interlibrary loan request service and rapid delivery of print and digital materials, made a research project of this magnitude possible.

A key component of the libraries' collaborative strategy has been a continually increasing investment in access to the journal literature in digital form. In 1993, the University made available the full text of selected journal articles indexed in the Computer Database and Expanded Academic Index databases that it had licensed from Information Access Corporation in 1991. In 1994, UC was one of nine institutions that planned and participated in The University Licensing Program (TULIP), an electronic journal experiment conducted in collaboration with Elsevier Science Publishers. When the CDL first went online in January 1999, it provided Universitywide access to about 3,000 digital journals. In January 2001, when the CMI project began, this number had increased to 5,500 titles. As of December 2003, as this report is being written, about 9,400 journals are accessible Universitywide through the CDL. The libraries' investment in electronic journals has been accompanied by continual development of tools to help users discover and gain access to them. In 1988, when the UC libraries made MEDLINE, their first shared abstracting and indexing database, available through the Melvyl catalog, provisions were made to link journal citations to catalog records of the libraries' journal holdings, so that catalog users could easily ascertain which UC campus libraries held the journals containing the cited articles of interest to them. When the full text of journal articles became available, links to the articles were added to the catalog displays. In March 2002, the CDL launched a full-featured context-sensitive service, *UC-eLinks*, which uses the OpenURL standard and SFX software from Ex Libris, Inc., to allow library users to easily move from an article or book citation to the electronic version of the item; to check to see if the item is available on the local campus or to request items not available locally.

In 1999, the University Librarians' advisory structure recognized the need to define strategies for managing mixed collections of print and digital materials. The Collaborative Strategies for Managing Print in the Digital Environment task force was charged to explore these issues. The task force identified and analyzed a limited number of alternative strategies for archiving print materials. Their final report identified issues and suggested principles for assembling complete runs of serial backfiles to serve a persistent print collection.⁶

The Systemwide Library and Scholarly Information Committee (SLASIAC) was established in 1998 as an outgrowth of the LPAI to advise the University on systemwide library policies, strategic priorities, systemwide long term planning for the nine campus libraries and the CDL, and on strategies to enhance and facilitate scholarly and scientific communication in a digital environment. In January 2000, SLASIAC adopted the first of many resolutions related to library collection management. Resolution A endorsed "the development and implementation of an action program for a broad selection of journal titles currently or prospectively acquired by UC in both print and digital form. This program should ensure the archival retention of high-quality print copies of each title at the University's Regional Library Facilities and to explore the feasibility of reliance on the

⁶ Developing a "Copy of Record": Archiving Pilot Project for the University Of California. Report of the Task Force on Collaborative Strategies for Archiving of Print in the Digital Environment. February 2, 2000, Revised by SOPAG, 2/25/00 (<http://libraries.universityofcalifornia.edu/sopag/cstf/CSTF_Final_Report_Rev.html>)

electronic copies of these journals to meet the various usage requirements of the UC community.”⁷ The Resolution also supported experiments that would help the University increase its understanding of strategies for creating a durable, reliable archive of its print and digital collections. Among the motivations for this resolution were the challenge to the University of accommodating up to 60,000 new student enrollments over the next ten years while continuing to address urgent seismic safety deficiencies, replace deteriorating campus infrastructure, upgrade critical but obsolescent instruction and research facilities, and manage a growing deferred maintenance backlog.⁸ Existing and expected capital budget resources were deemed insufficient to meet this challenge. Therefore, the Resolution concluded that the University has a compelling interest in managing existing library facilities to accommodate continually growing collections of print library materials while relieving the pressure on its overtaxed capital program.

In anticipation of undertaking the experiment described in SLASIAC Resolution A, the University applied for and was awarded a planning grant by the Mellon Foundation in early 2000. The University’s proposal drew in part on the final report of the Task Force on Collaborative Strategies for Archiving Print in the Digital Environment and on Resolution A. As an outgrowth of the planning grant, a formal grant proposal was submitted to the Foundation in November 2000, outlining the proposed design of research objectives and methodology.

1.3. INSTITUTIONAL FOUNDATION FOR THE COLLECTION MANAGEMENT INITIATIVE

The University of California’s long tradition of collaboration in collection building and resource sharing has become increasingly important in an environment of budgetary constraints and digital license agreements based on publisher-held packages. The creation of the CDL enabled the establishment of an organizational infrastructure for consultation, licensing, and acquisitions building.⁹

⁷ Systemwide Library and Scholarly Information Advisory Committee. Resolution A: Archiving of Print Copies of Journals Available in Both Print and Digital Formats, Approved January 14, 2000 (http://www.slp.ucop.edu/consultation/slasiac/SLASIAC_Resolution_A.html)

⁸ Systemwide Library and Scholarly Information Advisory Committee, *op cit.*

⁹ See discussion on history of planning and collaboration and licensing strategies in French, Beverlee; “The Economics and Management of Digital Resources in a Multi-Campus, Multi-Library University: the Shared Digital Collection,” Center for Research Libraries, Aberdeen Woods Conference, November 2002 (<http://www.crl.edu/content.asp?l1=2&l2=48&l3=94&l4=41>)

In order to maximize limited financial resources while continuing to build library collections and effectively utilize library space, the University Librarians believed that the CMI could suggest future strategies and policies for managing print journal collections with digital counterparts.

The grant proposal's primary goal was a systematic evaluation and assessment of the factors that affect faculty and student reliance on print and digital resources. The central component of the project was an experiment involving the withdrawal from UC campus libraries of selected print titles that were available in both print and digital formats. Participation by each of the campuses in the project was crucial to its success. After extensive consultation with faculty and library staff on each campus, each University Librarian committed his or her campus library personnel and resources to full participation in the project.

2. JOURNAL USE STUDY

The central component of the Journal Use Study was an experiment involving the withdrawal from the UC campuses of selected journals that were represented in both print and digital formats. During the Study faculty and students had to rely on the digital versions of these journals for primary access to the content. The goal of the experiment was to assess the characteristics affecting the use of digital journals as substitutes for print. Usage data for selected print and digital journals was gathered while the print journals were in remote storage. The Study was carried out in two phases, a preliminary period of consultation, planning, and selection of journal titles, followed by a year-long implementation phase.

2.1. CONSULTATION AND PLANNING

Phase I was largely devoted to planning for the implementation of the Journal Use Study, which included: consulting with library staff and users about the selection of journals to be included in the study; publicizing the study; processing the journals selected for the study; and transferring physical volumes and unbound issues to storage. This phase extended over nine months, during which CMI staff consulted extensively with the University Librarians, advisory groups, faculty, and library staff on the campuses regarding all aspects of journal selection and implementation of the project. The Project Director visited each of the campuses and talked with groups of faculty and librarians about the project and how campuses might participate in the study.

2.1.1. Campus Participation

A letter was sent to University Librarians inviting their participation in the Journal Use Study. Campuses were given the option of participating as either an experimental site, as a control site, or as both¹⁰. Experimental sites removed selected print journals to remote storage and counted each request to return an issue or volume to campus. Control sites maintained the same selected journals on library shelves and counted circulation and in-house use of those journals. In addition, plans were made by project staff to gather digital usage data for the final list of selected journals.

The letter also requested that an individual be designated from each campus as CMI Liaison. This individual would serve as the initial point of contact for project-related matters, and ensure effective coordination and communication for project-related activities on each campus.

All nine UC campuses elected to participate in the Journal Use Study. Six campuses agreed to serve as both control and experimental sites for different journals; two campuses, UC San Francisco and UC Santa Barbara, agreed to participate as experimental sites only; and UC Riverside elected to be a control site only.

¹⁰ The term “experimental,” as used in the CMI project, denotes the role of the campus libraries participating in the Journal Use Study’s “experiment” by removing printed journals from the library shelf and asking users to rely primarily on the digital versions of those journals. The term “control” denotes the role of campus libraries that retained the same journals on their shelves and closely monitored their use during the Study. While this design provided useful comparative information on print and digital use of Study journals, the terminology should not be understood to imply that a scientifically-controlled experimental design was used.

2.1.2. Role of the CMI Operations Advisory Committee

The CMI Operations Advisory Committee (see Appendix C) was formed to advise CMI staff on issues related to the consultation and implementation phases of the project. During Phase I, six task groups were appointed to address issues related to planning for implementation, including:

- Determining appropriate bibliographic access to study titles, particularly print titles relocated to storage at experimental sites, in an environment made up of nine separate online catalogs and a union online catalog for the entire system.
- Developing methods and definitions for gathering use data.
- Developing strategies for gathering information from users who request that print journals be returned from storage at experimental sites.
- Developing a survey to gather information from the campuses about the consultation process.
- Determining options for publicity and creating adaptable publicity tools available for use on all campuses.
- Developing methods for collecting information about costs of implementation at the campus level.

The recommendations of the task groups were critical to the successful implementation of the study. The task groups addressed policy and procedural issues and produced planning documents that were utilized by the campuses and CMI staff throughout the project. For example, the task groups: recommended that bibliographic information for titles relocated to storage be revised and displayed only in the Melvyl Union Catalog; surveyed methodologies used on the campuses for counting use; recommended the creation of a survey for users who requested that a print journal be returned from storage (see the Return Request Survey, Appendix D); created a cost taxonomy to support the planned cost study; and drafted a consultation survey to gather information about aspects of the consultation process among CMI staff, campus librarians, and faculty.

2.1.3. Criteria for Selection of Journals

During the planning phase, the following criteria were developed by CMI project staff in consultation with faculty advisory groups and librarians to inform the selection process. These criteria were used by CMI staff to select eligible journals from the corpus of electronic journals licensed by the University of California. In particular, CMI staff applied the first five criteria to create a database of eligible study titles. While CMI project staff oversaw the selection process to ensure that the criteria influenced the final title choices, the last three criteria were particularly relevant to the campus selection process:

- All journals selected must be available in digital form on all campuses.
- The print title must be held in more than one library in the UC system so that the project would be able to gather usage data for print runs on library shelves on campus and usage data for print journals relocated to storage.
- Sufficient use data must be available from the electronic journal publisher in order to obtain use by title and by campus.

- The sample of journal titles should include multiple publishers of electronic journals.
- The sample of journal titles should include titles for which current issues are available in digital form and titles for which the digital version is available only retrospectively in back runs, e.g., JSTOR titles, so that the project would be able to gather cost and usage data for both publishing models.
- The choice of journals should allow for the study of a variety of factors influencing use, including content characteristics, such as graphics, language, and article length.

2.1.4. Database of eligible journals

When Phase I of the Journal Use Study began in January 2001, nearly 6,000 electronic journal titles were licensed by the University Libraries through the CDL and available to faculty, students, and staff on every campus. Publishers and providers of these digital journals were queried to determine whether they could provide the usage data specified in the criteria, specifically the counts of use by journal title, by campus, and by time period (at a minimum, quarterly). The 15 publishers and journal providers capable of delivering the required use statistics are identified in Table 1.

Applying the use criteria to the pool of ejournals licensed by the University of California reduced the number of eligible titles from 6,000 to 2,683. The most important criterion was the ability to acquire usage data by journal title and by campus. To assist campuses in the selection process, an initial CMI database of eligible titles was created with the ISSN, journal title, publisher/provider, LC classification, type of usage data provided by the publisher/provider, and campus print subscriptions at the time of the license agreement. Campus library staff were urged to be as inclusive and expansive as possible when submitting their initial selections. Using their knowledge of collection use, faculty interest, print subscriptions, and volume holdings, campus library staff selected journal titles from the database of eligible titles and indicated willingness to serve as either a control or experimental site (or both) for each selected journal. CMI staff then matched journals identified by one campus as experimental titles with journals volunteered by another campus as control titles to ensure that there would be one control site and one experimental site for each title included in the study.

Table 1. Publishers/Providers and the Number of Qualified and Selected Titles

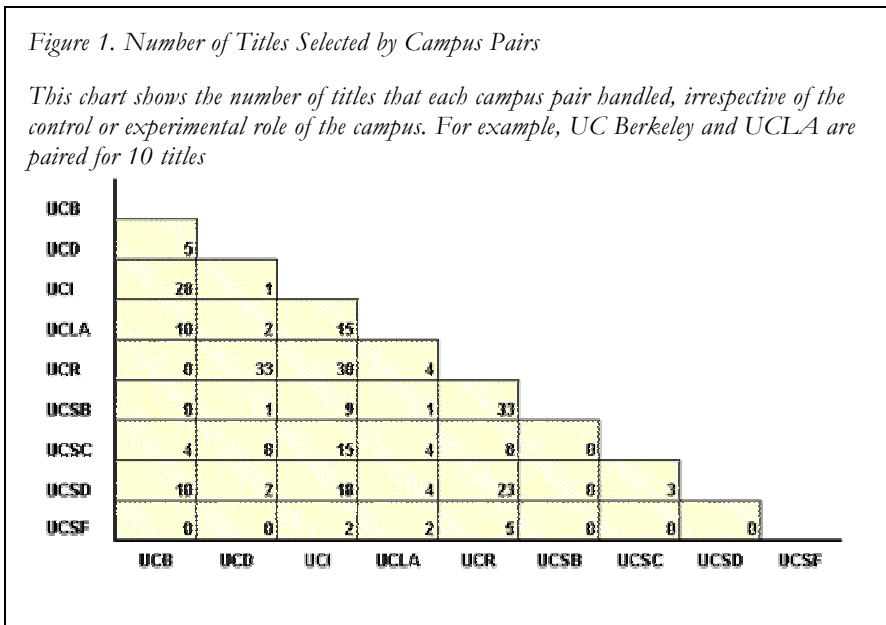
Publisher	Qualified Titles	Selected Titles
American Chemical Society	28	11
American Physical Society	7	3
Blackwell Science	199	18
Company of Biologists	3	1
Elsevier	782	130
IDEAL	161	15
Institute of Physics	30	11
JSTOR	201	44
Kluwer*	438	2
Liebert	28	1
National Research Council Canada	14	2
Project Muse	128	17
Royal Society of Chemistry	29	1
SIAM	11	5
Wiley InterScience	308	24
* Provider was unable to confirm ability to provide required statistics for most titles.		

After campus librarians submitted the first round of selections, CMI staff created four new files to report proposed title matches and to encourage additional nominations:

- “True Pairs” contained titles that had been selected by two or more campuses. The information was arranged by ISSN, Title, LC number, Experimental Campus, and Control Campus. In some cases, selected titles appeared more than one time with more than one possible campus pairing. This file indicated all of the possible combinations of campus “votes,” but not necessarily the final pairings of the titles.
- “Control Group needs experimental match” contained titles for which there was a control site but no corresponding experimental site
- “Experimental Group needs control match” contained titles for which there was an experimental site but no corresponding control site.
- “False Pairs” contained titles for which a campus had indicated it would serve as either a control or an experimental site if a corresponding match in either direction could be made. (Libraries could indicate their willingness to serve as either a control or an experimental site.)

The campuses approached the selection of journals from the list of eligible titles differently, depending on local circumstances. On some campuses, librarians consulted extensively with faculty on the choice of titles to submit. Other campuses did not to consult faculty on a title-by-title basis prior to implementation because they were concerned they would be limited to selecting only the least popular titles and they did not want to bias results. Several campuses reported that consultations with selectors and bibliographers were critical in their choice of titles. Several campuses selected titles only from branch libraries in physical or health sciences, or business. In addition, the practical aspects of campus journal holdings played a role. For example, one campus reported that it excluded all titles from a particular publisher because its journal holdings from that publisher were so limited. The question of whether to submit journal titles as experimental or control was also an individual campus decision. Campuses that elected to serve as control sites had to be prepared to oversee the counting of circulated and in-house journal use during the Study, a labor-intensive process; those that elected to serve as experimental sites had to be prepared for user reactions to the temporary removal of titles from their shelves.

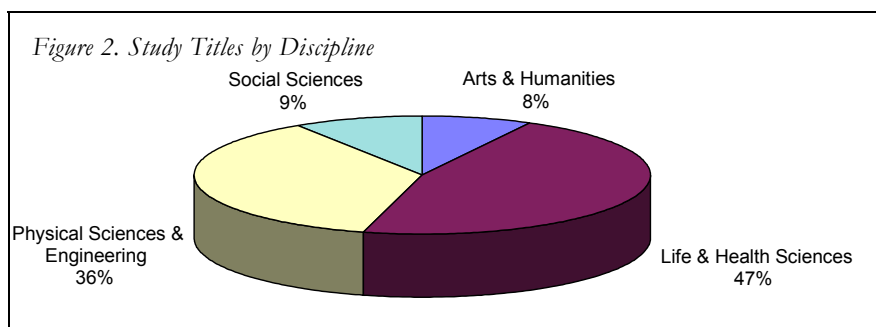
The process of identifying nominated journals and matching control and experimental journals was complicated by inconsistencies in bibliographic records and the general complexities of the serial literature, including typical problems such as title changes and ISSN’s that did not match the title. In addition, print runs of submitted titles were often not equivalent to digital coverage or not equivalent to the print holdings of the proposed



matching campus. These issues slowed the process of creating a final and definitive database of titles. Because of the labor-intensive task of collecting and recording usage data for control journals, the campuses were hesitant to volunteer control titles. Extensive consultation between CMI staff and the campuses was necessary to create the final selection of journals. See Figure 1 for an illustration of the final matched journal titles by campus. The final number of Study titles selected was 285. See Appendix F for the final database of selected CMI journals.

2.1.5. Disciplinary Breakdown of Journal Titles Selected

The final selection of journal titles for the Study was predominantly from science disciplines; 83 percent were in the physical, life, and health sciences and engineering; the remaining 17 percent of journals were from the humanities and social sciences. See Figure 2 for a breakdown of the disciplinary groups. This result approximates the subject distribution of all titles licensed by the CDL for the UC Libraries' shared digital journal collection in 2001.



2.1.6. Publicity

Campus librarians felt that it was critical to inform users that the libraries would be participating in a research study, and that some print journal volumes had been temporarily relocated to remote storage in order to carry out the research. The Operations Advisory Committee Publicity Task Group was charged with developing methods to publicize the project at participating campus libraries.

The Task Group recommended that CMI staff make a number of tools available to the campuses that could be used to inform faculty and students about the fact that selected journal runs were temporarily relocated to storage and that digital versions were available online. Among the recommendations was a public Web site with information about the CMI project, an opening day letter that the University Librarians could send to faculty, handouts to be used at public service desks to explain the project, sample signage to be used at shelf locations where experimental journal volumes had been removed, a compilation of frequently-asked questions (FAQ's) that could be used in handouts or on the CMI Web site, and comment cards to give library users an opportunity to express their concerns or pose questions. See Appendix G for examples of some of these tools.

During Phase II of the Journal Use Study campuses utilized publicity tools in a variety of ways to alert their user communities to the start of the project. Some campuses put up Web sites with lists of journals that had been relocated to storage. Most experimental sites put up signs at the shelves where print journals had resided explaining that the journals had been temporarily removed to storage, that a digital version was available, and that staff would assist users with requesting that print volumes be returned to campus. Several campuses distributed a version of the CMI Opening Day Letter that was created to explain the project to faculty. The letter began by saying:

“During 2001 and 2002, the University of California libraries will be participating in a research project funded by the Andrew W. Mellon Foundation. The goal of this project is to determine user responses to relying on digital access to selected journals, print holdings of which will be relocated to remote storage during the project. The study will test the hypothesis that effectively shared digital resources can begin to relieve the pressures on physical facilities and capital budgets to house and manage print materials.”

2.1.7. Consultation Survey

The Operations Advisory Committee Task Group on Consultation drafted a survey designed to gain information about intra- and inter-campus consultation and how it affected the CMI study (Appendix H). The Project Director distributed surveys to each of the nine campus CMI Liaisons in January 2002. All nine surveys were completed and returned.

The survey queried respondents about internal campus consultation. Responses indicated that CMI Liaisons worked with their University Librarians, technical services staff, collection coordinators, and selectors/bibliographers, among others (See Table 2). These consultations resulted in changes in the project implementation at seven campuses. Five of the CMI Liaisons reported that discussing the project parameters with bibliographers, faculty, the Academic Senate Library Committee, and library administration resulted in the addition or subtraction of journal titles in the study. Others reported that consultations with other library departments resulted in a more streamlined local implementation of the project.

Table 2. People with Whom the Majority of CMI Liaisons Consulted

	Campuses (#)
University Librarian	9
Technical Services committee or individuals	9
Collection coordinators	9
Selectors/bibliographers	9
CMI task force or team	8
Public Services committee or individuals	8
Library department heads	8
Assistant/Associate University Librarians	7
Academic Senate Library Committee	7
Faculty liaisons	6
Local storage unit manager	5

On the subject of communication between the campuses and the project staff at the UC Office of the President, the majority of liaisons felt that campus advice was incorporated into the project plan, that responses to questions were timely and that guidance from staff was clear. Some frustration was expressed about the timeliness of the correction and distribution of updates to the journal bibliographic database.

In terms of campus-to-campus communication, seven campus liaisons reported consulting with one another, with other campus bibliographers, or with the Regional Library Facility staff on title selection and local project implementation. Much of the campus-to-campus communication concentrated on clarifying bibliographic data and exact holdings for the titles under consideration. All the liaisons agreed that there was sufficient consultation among campuses. One liaison summed up the general feelings expressed: “I think we did amazingly well to coordinate that many titles, people, issues, etc.”

2.2. IMPLEMENTATION OF THE JOURNAL USE STUDY

The transfer of selected print journal runs, current issues, and bound volumes began in September 2001. By October 1, all campus libraries participating as experimental sites had moved more than 8,900 selected volumes and unbound issues to a storage location. UC Berkeley, UC Santa Cruz and UC San Francisco stored experimental volumes in the Northern Regional Library Facility. UC Irvine

and UCLA stored experimental volumes in the Southern Regional Library Facility. UC Davis, UC Santa Barbara, and UC San Diego stored their experimental volumes in local storage facilities. UC Berkeley also stored volumes from its Business Library locally. At control sites, libraries marked the same 8,900 volumes and unbound issues on their shelves and prepared to monitor their use. The proposal to the Foundation specified that print journals would remain in remote storage for at least 12 months. The study, which extended from October 1, 2001 through September 30, 2002, was divided into quarters. At the end of each quarter, CMI staff gathered usage data from the campus libraries, storage facilities, and electronic publishers/providers.

In addition, campus library staff collected for each title in the study information on the number of bound volumes and the shelf space they occupies, and tracked the staff time required to identify, select, and prepare journals for the study (either by marking them for usage monitoring at control sites, or relocating them to storage at experimental sites). These data were used in the cost study described in Section 5 and Appendix R.

2.2.1. Methodology for Counting Use of Journal Titles in the Study

The Operations Advisory Committee Task Group on Usage Data surveyed the campuses and found that they had no uniform method for tracking the usage of print journals. It was, however, imperative that CMI staff adopt a standard definition for print journal use if the data were to be comparable. The definition adopted for use of a control print journal referred to a "reshelving event." In other words, each time a print journal issue or volume was reshelved in a control library, it was counted as a single use. Use of an experimental print journal was defined as each time a user requested that a journal volume be returned temporarily to campus, whether the physical item was returned or a photocopy or telecopy was supplied in lieu thereof.

A Control Use Data Slip was developed by the Usage Data Task Group for counting the use of print journals housed in the library. See Appendix I for an example of the slip. Control data slips were placed inside each journal issue and volume in the Study. Quarterly, CMI staff emailed the campuses a spreadsheet listing their control journal titles; library staff used the spreadsheets to record journal use during the previous quarter.

To track use of experimental journals relocated to storage, a Return Request Form was developed for the campuses to use. In addition, the Regional Library Facilities, where many of the CMI experimental journals were stored, recorded requests for the return of CMI journals to a campus library using an experimental use worksheet.

Journal providers gathered data on the use of the digital versions of journals in the study. Usage reporting practices varied by provider. That is, some vendors counted access to article text as a use and some combined access to article text with access to the abstract. After consultation with advisory groups, CMI staff restated the definition of the use of a digital journal as follows: When publishers distinguished between abstract and full text use, CMI staff counted only access to the full text, and omitted the use of an abstract from the statistics. When publishers made no distinction between full text and abstract use, staff recorded the one figure provided.

2.2.2. Return Request Survey

The Operations Advisory Committee Task Group on ILL/Document Delivery Requests for Print Journals recommended the creation of a survey to gather information about why patrons requested stored print experimental titles. Library staff at the experimental campuses distributed a Return Request Survey to each user who requested a CMI print journal from storage. The Return Request Survey asked for demographic information, the journal title, and the volume being recalled. Respondents were also asked why they needed the print version and were given 15 specific reasons and an open-ended option from which to select an answer. Multiple selections were permitted. See Appendix D for a copy of the survey form. See Section 4 for a review of the findings from this survey.

2.2.3. System Downtime

The CMI Steering Committee recommended that staff track system downtime during the implementation phase of the Journal Use Study, as this could impact use data. To that end, CMI staff analyzed *CDL Alert*, an email service that notifies campuses when the CDL's server is down or a Web resource is experiencing system problems. See Section 4 for an analysis of system downtime during the Study.

2.2.4. Characteristics of Study Titles

In its original study design, the CMI team had proposed collecting a variety of information about the specific characteristics of each title in order to explore which, if any, of those characteristics was statistically related to the recorded use of the print or digital formats of the study titles. A list of the characteristics thought desirable for analysis is provided in Appendix P. After consultation with the project Research Advisory Committee and a special advisory group of UC librarians, it was determined that (a) in general, there were not agreed-upon operational definitions or measurement methodologies for many of the characteristics of interest, and (b) it would have been prohibitively expensive to inspect multiple issues of each of the 300 study titles and record information about its characteristics. On the recommendation of the project advisors, the CMI team did attempt to contact each of the publishers included in the study (see Table 1) to ascertain their publishing and editorial policies that might be relevant to an understanding of use rates and user preferences. The results, also provided in Appendix P, were available from only four of the publishers included in the study, and thus proved unhelpful in interpreting the project findings.

2.3. LESSONS LEARNED

Project staff and Campus Liaisons learned a good deal about the challenges inherent both in such a complex project and even in the solutions implemented to overcome some of the project's shortcomings. Below are the most significant of these lessons:

- **The length of the consultation and planning phase needed to be extended:** Because of the complex nature of UC's consultation structure, it took a significant amount of time for project staff to gather and coordinate input from faculty, campus liaisons, and operational staff on each campus, and to develop the final database of selected journal titles. To accommodate these challenges, the Journal Use Study planning phase was extended by three months.

- **Considerable serials expertise was needed:** Selection of journal titles for the Journal Use Study was unexpectedly difficult. Encountering title changes, determining the correct ISSN for a title, and matching volume holdings of a selected journal on one campus with those on another campus were just some of the challenges encountered by project staff. Unfortunately, the initial bibliographic database of selected journal titles contained many errors. While campus librarians submitted corrections, these corrections were not always applied quickly, which caused some frustration on the campuses. It would have been helpful to have project staff with serials expertise involved in the creation the bibliographic database or to assign the development of the database to a campus library serials operation.
- **Operational procedures, guidelines, checklists, and FAQs were needed during the planning phase:** While development of the operational details of the Journal Use Study was facilitated by the recommendations of the Operational Advisory Committee subgroup reports, unanticipated questions and concerns arose prior to final implementation. The development of procedures, guidelines, checklists, and FAQs during the planning phase was essential.
- **Consultation with the Research Advisory Committee was needed:** It would have been helpful to have the Research Advisory Committee consult on the implementation of the Journal Use Study during the planning phase to determine whether the study reflected valid research methodology. A joint meeting with the CMI Liaisons and the Research Advisory Committee early in the process would have been useful.

3. USER PREFERENCE SURVEY

3.1. PLANNING

The data from the Journal Use Study had two fundamental limitations. First, the available data could not provide any information about those who used the journals, and second, the data could not provide the reasons users preferred a particular format. The University's proposal to the Foundation had envisioned the use of user surveys to address these issues, and the project team and advisory groups considered several methods for administering a survey for the Journal Use Study titles. However, no feasible method was identified to administer a point-of-use survey to users of both digital and print titles. Because the number of titles included in the Journal Use Study was relatively small (285), it was expected that the number of survey responses that would result from surveying only the users of these journals would also be small. Therefore, the method chosen to examine user preferences, behaviors, and attitudes was an independent User Preference Survey. To assure that the survey asked the right questions and elicited meaningful answers, its design and methodology were based on consultation with the CMI Research Advisory Committee, an examination of other recent library survey efforts,¹¹ a series of formative interviews with representative journal users, and an online pre-test. Specific areas of interest for the survey included why print or digital formats were chosen for particular kinds of uses, what types of use were deemed suitable for digital journals, possible barriers to digital journal use, and whether characteristics of journal content that might be related to preferences for digital or print.

The User Preference Survey, the formative interviews, and the Survey pre-test all required campus-level review and approval for the use of human subjects to assure that the participant's rights were protected. The CMI project staff and the University Librarian at each campus accepted local responsibility for the protection of human subjects. All invitations to participate in the three components of the survey included a statement of voluntary participation, informed consent, and the address of the project Web site for access to survey results, in accord with institutional research policy on the survey of individuals.

3.1.1. Formative Interviews

In May and June, 2002, 40 individuals from the UC Santa Barbara and UC San Diego campuses were interviewed on their use of digital and print journals available through the CDL. The objectives of the formative interviews were to: refine the wording of survey questions; determine whether the questions were meaningful and answerable; and determine whether the response categories were exclusive,

Table 3. Target Population for CMI Formative Interviews

	Faculty	Graduate	Under-graduate	TOTAL
BOTH CAMPUSES				
Arts & Humanities	6	3	2	11
Physical Sciences & Engineering	6	3	2	11
Life & Health Sciences	6	3	2	11
Social Sciences	6	3	2	11
TOTAL	24	12	8	44
UCSB				
Arts & Humanities	4	2	2	8
Physical Sciences & Engineering	4	2	2	8
Life & Health Sciences	2	1	2	5
Social Sciences	4	2	2	8
TOTAL	14	7	8	29
UCSD				
Arts & Humanities	2	1		3
Physical Sciences & Engineering	2	1		3
Life & Health Sciences	4	2		6
Social Sciences	2	1		3
TOTAL	10	5	0	15

¹¹ See, for example, Cook et al. (2001), Blixrud (2002), E-Journal Use Study (2002), and Friedlander (2002).

exhaustive, and relevant. Although the interview pool was not randomly selected, the criteria for inclusion in the interview pool reflected the demographics CMI staff were interested in. Individuals represented a range of academic disciplines, and faculty, graduate students, and undergraduates were included at both campuses. The distribution of the interview sample is detailed in Table 3. Since there was interest in the opinions and experiences of both print and digital users, the level of experience with either medium was not critical. Campus librarians suggested names of possible interview subjects. The individuals actually interviewed were those who agreed to participate and whose schedule could accommodate the times available for interview. All interviews were conducted face-to-face.

The interview instrument was a questionnaire (Appendix J), with accompanying interview script, consisting of three sections:

- **Section 1:** Thirteen questions on user preferences and use patterns for digital and print subscriptions. In addition, subjects were asked to explain their reasons for preferences and habits in journal usage.
- **Section 2:** Four questions on the subjects' technical environment at work and home, including computer operating systems, age of equipment, and specific technical problems.
- **Section 3:** Demographic information for each subject.

Prior to completing the questionnaire, subjects were told the purpose of the project and that their responses would be anonymous. Because the objectives of this interview were formative, the interviewer pursued opportunities for discussion with the interviewees. At the completion of each interview, subjects were asked to offer their thoughts on their experiences with digital journals that had not already been covered. Each interview took approximately one and a half hours.

Lessons learned from the interviews were used to reformulate questions, eliminate questions, and formulate new questions. Some key findings from the interviews influenced the final survey design, including:

- **Training:** Many were unaware of the programs and assistance available at the libraries, including proxy access to digital journals. Most faculty interviewed had never had formal training in using digital resources in their subject areas. Those who had training found it very helpful.
- **Graphics:** The best quality graphics were important to a large number of the interviewees. This was not a matter of preference for digital or print, but was essential to academic uses of the information: for example, the pathologist comparing electron microscopy in the lab with photographs in print or digital images online.
- **Access to information or indexing:** Several interviewees mentioned that a universal index to digital articles is needed and that indexes for print materials are more general and comprehensive. Interviewees also commented that they could navigate intuitively in print but not in the digital realm, since differing formats of digital indexes and the journals themselves made things hard to find.
- **Tables of Contents:** A number of people noted that the ability to search for digital content at the article level has a drawback: one can go directly to the article, and never see the table of

contents or surrounding material. The serendipity of finding similar or related material was lost in digital formats.

- **HTML and PDF:** Knowing the differences between each and how to best use the features of each would help faculty and students make better use of digital resources.

The complete report on the formative interview results is available in Appendix K.

3.1.2. Survey Design and Pre-test

The final User Preference Survey had 60 questions with scaled responses, multiple choice responses, and narrative responses (Appendix L). The survey covered five general areas:

- Frequency of use of digital and print journals.
- Format preferences for a variety of common tasks.
- Advantages of digital journals.
- Barriers to the effective use of digital journals.
- Demographics of the respondent.

The survey took approximately 30 minutes to read and answer in paper or Web form.

The UC Santa Barbara Social Science Survey Center helped refine the survey instrument, conduct a pre-test, manage the implementation, and provide survey data services. During December 2002, a two-week pre-test of the Survey was administered to a sample of 200 faculty and graduate students and 50 selected members of the project advisory groups at the invitation of the CMI project Principal Investigator. As a result of the pre-test, CMI staff added two open-ended questions to increase opportunities for comments and improved scales for responses. In addition, the questionnaire was organized into sections that included specific instructions and encouragement to continue to the end.

3.1.3. Survey Sample

The sampling plan for the User Preference Survey was designed with the assistance of the UC Santa Barbara Survey Research Center to obtain sufficient responses from a random sample of the UC community to provide a precision of ± 5 percent for the responses to any single question,¹² for each of the principal groups within the community: faculty, health care professionals, staff, graduates, and undergraduates (as the survey focused on the attitudes and preferences of library users, UC librarians were not included in the populations to be sampled). Because it would have been prohibitively expensive to attain this level of precision for all groups using a random sample of the entire UC population, given the differences in their size and expected response rates, a stratified design was developed to yield the desired precision for each group independently. In addition, UC librarians expressed interest in a design that would provide a similar level of precision for each group

¹² That is, to ensure that with 95% confidence, the distribution of responses to any single question is within ± 5 percent of the expected distribution of responses in the population sampled.

for each of the nine UC campuses. The experience of the UCSB Survey Research Center suggested that a very large and expensive sampling program would be needed to achieve this precision at the campus level for undergraduate students and staff, owing to anticipated low response rates, but the goal appeared achievable for faculty and graduate students.

The sampling plan was therefore designed as a two-stage stratified sample that would yield the desired level of precision for each demographic group and, in the case of faculty and graduate students, for each campus. In a stratified sample, each component of the overall population is sampled separately to achieve the desired level of precision for that component. Subsequently, the survey results for each component must be “weighted” to represent that component’s share of the overall population. The weighting scheme for the CMI stratified sample is described in Section 3.2 below.

The samples for the populations of academic and professional staff were selected using the UC systemwide Personnel Data System. The samples for registered students were selected from the student data systems maintained by each campus.

The five population groups used to draw samples for the User Preference Survey were:

- **Faculty and Researchers:** Individuals in faculty and research classifications, excluding current graduate and undergraduate students employed in these classifications, and excluding librarians. For purposes of the sampling plan, the two groups were considered together, but for convenience in extracting samples from UC personnel systems, the two groups were sampled separately. Experience indicated a high response rate for these individuals. To achieve a precision of ± 5 percent at the campus level, 3,097 responses were needed from a sample of about 7,200 distributed equally among the nine UC campuses.
- **Health workers:** Individuals in the physician, nurse, and medical resident classifications at the five campuses with hospital residency programs. A ± 5 percent precision across the campuses required 368 responses from a sample of about 900.
- **Staff:** Individuals in the management (MSP) and professional (PPS) classifications, specifically excluding executives, clericals, and crafts. For precision of ± 5 percent across the campuses, about 400 staff responses were required. However, a lower response rate was expected because staff in different classifications have different levels of involvement with the library. Lacking numbers about the use rates of library services among staff, a sample size of about 1,200 was drawn.
- **Graduate students:** Current graduate students, excluding those whose first term of attendance was fall 2002. A sample with ± 5 percent precision at the campus level required responses from 3,215 individuals out of 10,000 surveys distributed equally among the campuses.
- **Undergraduate students:** Current undergraduates, excluding those whose first quarter of attendance was fall 2002. A sample with ± 5 percent precision across the campuses with 400 responses required a sample of 4,400.

This two-stage stratified random sampling methodology provided for a 95 percent confidence interval of ± 5 percent at the campus level for

Table 4. Characteristics of the CMI Survey Population and Samples

Sub-population	Faculty	Graduate Students	Health Care	Staff	Undergraduates	Other	TOTAL
Total Population	23,672	39,254	25,940	100,921	148,024		337,811
Invitations	7,059	10,322	1,342	1,238	4,403		24,364
Target Response	3,097	3,215	368	400	400		7,480
Actual Response*	2,492	3,832	193	340	315	48	7,220

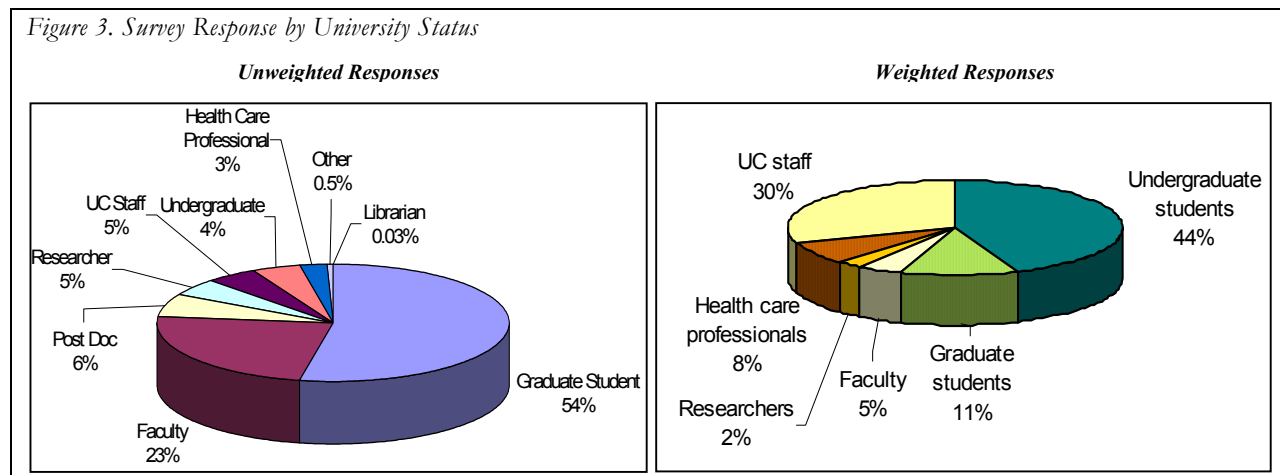
* Survey respondents self-reported their University affiliation

the responses of faculty and graduate students, and at the systemwide level for undergraduates, campus professional staff, and health science professionals (see Table 4).

3.2. IMPLEMENTATION

The UC Santa Barbara Social Science Survey Center administered the survey during February and March of 2003. Pursuant to the sampling plan, about 20,000 UC faculty, students, and staff were invited to participate. Anticipating that respondents might differ in their preferences for print or digital survey formats, all invitees were given the choice of responding on paper or online. Because of the characteristics of the contact data in the sources used to draw the samples, it was necessary to use two modes of survey delivery. For faculty and graduate students, a personalized letter of invitation from the campus University Librarian requested their participation, with the option of answering the survey using an enclosed paper form or via the Web. Staff and undergraduate students were contacted by email with a URL for the Web survey and instructions for requesting a printed questionnaire if preferred. All groups received three email reminders. The possibility of duplicate responses was addressed by issuing an identifying number, which was affixed to the printed survey form or used to logon to the Web site.

The User Preference Survey was in the field for five weeks during February and March of 2003. By the end of the data collection period on April 1, 2003, more than 7,000 responses had been received (a response rate of 35 percent). Participants included 2,492 faculty and 3,832 graduate students, accounting for 77 percent of the responses (see Figure 3). Respondents self-identified their University affiliation.



As discussed in Section 3.1.3 above, a separate sample was drawn for each population group included in the survey with the sample size for each group determined by the target level of precision needed for that group, and without regard for the group’s size relative to the overall study population. For example, only about 400 responses from undergraduate students were needed to provide the desired level of precision, and 315 responses were received from undergraduates, but undergraduate students represent about 44 percent of the UC population (see Table 4). To ensure that aggregate survey results properly represented the combined population, it was necessary to weight the results from each group in order to approximate that group’s proportionate representation in the overall population. For example, to adequately represent undergraduate responses in analyses that combined responses from multiple groups, the undergraduate responses were given a weight that reflected their proportionate numbers in the UC population.

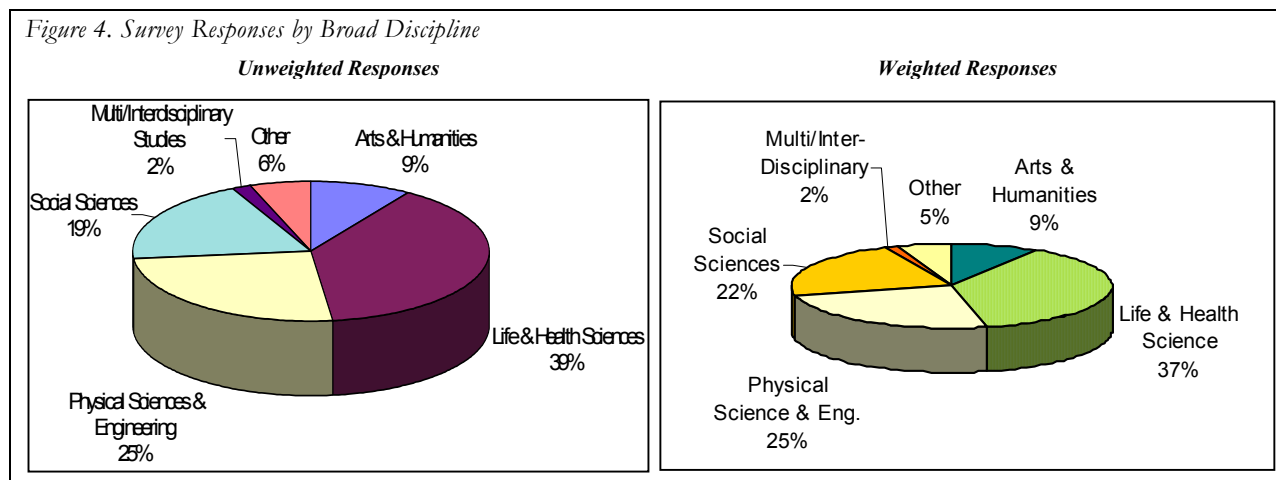
Pursuant to the original two-stage sampling plan, a two-stage weighting scheme was developed. The scheme first determined the weight

Table 5. Weighting Factors for CMI User Preference Survey Responses

	UCB	UCD	UCI	UCLA	UCR	UCSB	UCSC	UCSD	UCSF
Undergraduate students	152.32	152.32	152.32	152.32	152.32	152.32	152.32	152.32	152.32
Grad students & post docs	5.27	2.99	2.58	11.53	1.14	1.59	1.00	2.48	1.14
Faculty	4.62	3.21	2.40	6.49	1.20	2.08	1.60	2.94	2.89
Researchers	9.12	9.76	5.33	7.46	5.95	3.85	2.97	7.16	8.16
Health care professionals	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50	43.50
UC staff	97.81	97.81	97.81	97.81	97.81	97.81	97.81	97.81	97.81

to assign to each demographic group to represent its overall proportion in the UC community. Second, because faculty, research staff, and graduate student responses were additionally stratified by campus, additional weights were assigned to the responses of these groups on a campus-by-campus basis to reflect their actual distributions among the campuses. The resulting weighting factors are shown in Table 5. Weighted data are used in the tabulations and analysis in Section 4; details of unweighted responses are in Appendix Q. A comparison of the unweighted and weighted distributions of respondents by affiliation is shown in Figure 3).

Faculty and graduate students also identified their academic field or area. To aid analysis, the responses on academic field were classified into broad disciplines¹³ (see Figure 4). The broad



¹³ Broad disciplines were defined as life and health sciences, physical sciences and engineering, arts and humanities, social sciences, and multi/interdisciplinary, using the taxonomy maintained by the UC Office of the President Division of Academic Affairs for the classification and reporting of approved academic programs. Respondents’ academic field, as reported in response to survey question 11, was classified into these broad disciplines.

discipline areas of the respondents were distributed across disciplines in proportions similar to those of general campus distributions.¹⁴ Figure 5 shows the weighted distribution of survey respondents by discipline in comparison with the disciplinary distribution of UC faculty in October, 2002.¹⁵ Figure 5 suggests that the arts and humanities and physical sciences and engineering may be slightly under-represented in the survey responses relative to the health sciences and interdisciplinary respondents, but the differences are relatively small, and may arise because respondent self-reports of disciplinary affiliation differ from official University statistics, or from differences among the disciplines in dependence on the journal format for research and teaching.

Twenty-eight percent of the respondents chose the paper survey mode and 72 percent chose to answer via the Web. The number of responses was fairly even across the campuses, with the exception of UC San Francisco (see Figure 6). UC San Francisco's relatively high number of responses was likely due to a preponderance of health care professionals, who had high rates of response to this survey, and an absence of undergraduates, whose response rates were considerably lower.

Figure 5. Disciplinary Distribution of UC Faculty and Survey Respondents

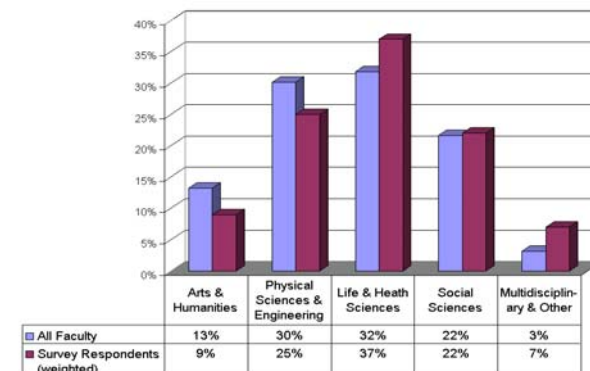
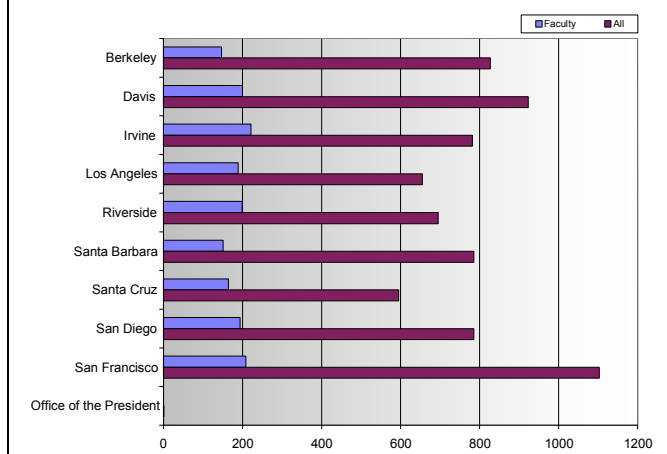


Figure 6. Survey Responses by Campus



¹⁴ See *University of California Statistical Summary of Students and Staff Fall 2002* at <<http://www.ucop.edu/ucophome/uwnews/stat/>>

¹⁵ University of California, Office of the President, Academic Advancement. *All Ladder Rank Faculty by Field and Sex, October 2002*, published October 2003 (<<http://www.ucop.edu/acadadv/datamgmt/faculty1.pdf>>)

4. FINDINGS FROM JOURNAL USE RESEARCH

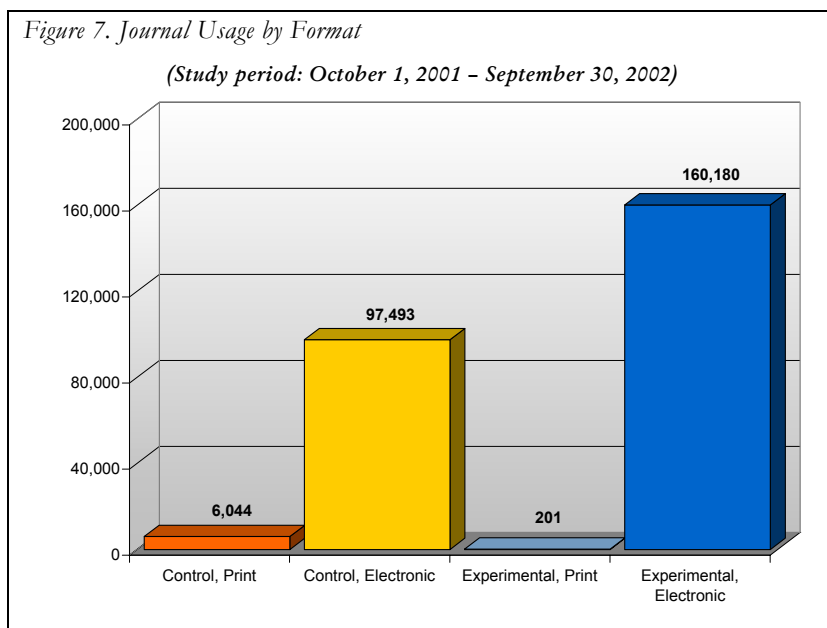
The project objective to study the behaviors and attitudes of users and to ascertain the factors affecting the acceptability of digital publications as substitutes for equivalent print publications was addressed using two primary sources of data: the Journal Use Study and the User Preference Survey. Together, these sources illuminate both the extent of the use of electronic journals and their print counterparts, and some of the characteristics of library users' preferences for these formats.

In reviewing the findings, it will be helpful to recall that the Journal Use Study and the User Preference Survey were entirely independent studies. The User Preference Survey was not limited to those who used the Journal Use Study titles, but was distributed to a stratified random sample of the entire UC community, and no mention was made in the Survey of the Journal Use Study or the specific Study titles.

4.1. PRINT AND DIGITAL JOURNALS: USE PATTERNS AND PERCEPTIONS

4.1.1. Findings from the Journal Use Study

During the 12 months of the Journal Use Study, digital use of study titles greatly exceeded print use of the same titles, at both experimental and control locations (see Figure 7).¹⁶ In all four of the general disciplinary areas represented in the Journal Use Study, digital use exceeded print use by a factor of at least ten. Because so few print issues were recalled from storage at experimental campuses (Figure 7), calculating a ratio of digital to print use for these titles was not meaningful. At control campuses, however, electronic use was on average more than sixteen times that of print use (see Table 6). For physical sciences and engineering, that ratio was predictably higher at 34 digital uses per single print use. Notably, the ratios for arts and humanities and social sciences were similar to life and health sciences at approximately ten digital uses to one print use.



The fact that use of digital journals was considerably higher at experimental campuses (see Figure 7) appeared at first glance to be a result of the experiment; that is, removal of the print journals from

¹⁶ For the purposes of this study, “digital use” is the number of journal article views/downloads, as reported by the publisher/supplier; “print use” is the number of a) “reshelving events” at control sites or b) recalls of print from experimental sites. See section 2.2.1 for details.

the shelves drove an increase in digital use. To examine how much of this higher digital use might indeed be attributable to the storage of print, the year-to-year change in digital use was examined. This showed that digital use was greater at experimental campuses both during the study and in the year prior; apparently users at experimental campuses were simply more predisposed to digital use – and hence perhaps the willingness of such campuses to serve as experimental sites (see Table 7).

Table 6. Ratio of Electronic to Print Uses

Subject Category	Number of Titles	Control Campus Usage		Ratio of Electronic to Print
		Electronic	Print	
Arts & Humanities	22	5,475	528	10.4 to 1
Life & Health Sciences	130	34,449	3,601	9.6 to 1
Physical Sciences & Engineering	102	54,757	1,635	33.5 to 1
Social Sciences	26	2,812	280	10 to 1
Grand Total	280	97,493	6,044	16 to 1

Journal issues removed to storage at experimental campuses were not frequently requested; a total of 201 items were recalled, equaling about 3 percent of the use of the same titles at campuses that

Table 7. Year-to-Year Change in Electronic Use
 Usage for January-September 2000 (Prior Year) and January-September 2001 (Study Year)

Subject Category	Control Campus Electronic Use			Experimental Campus Electronic Use		
	Prior Year Uses	Study Year Uses	Change from Prior Year to Study Year	Prior Year Uses	Study Year Uses	Change from Prior Year to Study Year
Arts & Humanities	4,763	4,256	-10.6%	5,278	7,733	46.5%
Life & Health Sciences	20,333	27,407	34.8%	50,665	65,183	28.7%
Physical Sciences & Engineering	32,466	44,607	37.4%	33,194	46,937	41.4%
Social Sciences	1,885	2,132	13.1%	3,398	4,546	33.8%
Grand Total	59,447	78,402	31.9%	92,535	124,399	34.4%

retained the materials on the shelves (see Figure 7). As one approach to discovering key factors that influenced print usage, CMI staff surveyed library users who recalled the print version of a journal from storage rather than use the available digital version. As described in Section 2.2.2 above, library staff distributed a Return Request Survey (Appendix D) to each user who requested a CMI-tracked print volume from storage. The Return Request Survey asked for demographic information and the journal title and volume being recalled. Respondents also were asked why they needed the print version, and were given 15 pre-determined reasons and an open-ended “other” option from which to select an answer. Multiple selections were permitted.

Sixty-three completed surveys were returned, for a response rate of 31 percent. The unavailability of content in digital form was identified as a reason for having the print recalled by 60 percent of the respondents (Table 8). Thirty-eight responses indicated that the user needed the print version because the electronic version was incomplete (28), or because of system problems (5) or off-campus access problems (5). The two other common reasons given were: the user preferred browsing, reading, and/or studying the print version (18); and the user was not aware that the online version was available (7). No other reasons garnered more than three affirmative responses. Appendix E contains a full list of the reasons provided.

While the number of respondents was too small to meaningfully correlate answers with demographic information, we can examine the University affiliation of those who completed the survey (Table 9), and the representation among the broad disciplinary areas (Table 10).

Table 8. Most Common Reasons for Recalling Print Journals from Storage

	#
The online version is incomplete - I need material only available in the print version.	28
I prefer to browse or scan the volume/issue in the print format.	14
I prefer to read the material in the print format.	13
I was unaware that an online version was available.	7
I was unable to gain access to the material when I needed it due to system problems, such as unavailability of the server on which the material is stored.	5
I was unable to access the online version from my off-campus location.	5

Table 9. University Status of Return Request Survey Respondents

Graduate Student	31
Faculty	12
Non-UC	5
Post Doc	4
Undergraduate	4
Staff	3
Other UC	3
Not Stated	1
Total	63

Table 10. Broad Disciplinary Area of Return Request Survey Respondents

	#
Life & Health Sciences	27
Physical Sciences & Engineering	10
Arts & Humanities	5
Multi/Interdisciplinary Studies	4
Social Sciences	2
Not Stated	15
Total	63

As noted previously, library users at campuses that hosted experimental titles had numerous opportunities to comment on the experiment, including: comment cards at the shelf where the experimental volumes had been removed, comment cards at reference desks, and a comment feature at the project's public Web site. Library staff were asked to forward any anecdotal reports of user reactions to the project, such as oral comments from users at public service desks. Free-form comments, it was hoped, would help identify situational factors in format preference not recognized elsewhere. CMI staff received 26 free-form comments (compiled in Appendix O). Eighteen comments expressed a preference for print journals, two comments expressed a preference for electronic journals, and six comments were neutral. In addition to a general preference for print, a commonly expressed view was that using electronic journals was not convenient: journals or finding aids were cumbersome (8), unreliable (7), or too slow (3). Difficulty in reading or scanning articles on the screen was another common concern (9); one person mentioned that vision problems made digital use difficult. Another concern was the inability to print an article or graphic that was equal in quality to the print version of the journal (5). Five comments suggested that a library just isn't a library without print journals. Two people expressed some indignation that the print versions of "first-tier" journals had been removed from the shelves. Besides providing some insight into the reasons patrons may prefer a specific format of journal, these free-form comments helped CMI staff formulate the User Preference Survey.

One frequently-voiced concern about complete reliance on the digital versions of journals is that they deny the user the opportunity to conveniently browse recently-received issues of journals of interest, as might be provided on display shelves in current-periodical reading rooms. To provide some data that might help evaluate this concern, for the last three quarters of the Journal Use study, the campus libraries kept separate tallies for the reshelving of unbound issues and bound volumes of control titles. Results are shown in Table 11. In this presentation, use of bound volumes is normalized by dividing total uses by the number of volumes (to account for differences that might result from longer or shorter bound back files). The titles provided by JSTOR¹⁷ are excluded, as for most of these current issues are not available in electronic format and were therefore not included in the range of issues monitored in the study.

Table 11. Ratios of Use of Bound and Unbound Issues of Control Titles

Subject Category	Total Unbound Uses per Title	Total Bound Uses per Volume	Ratio of Current Issue Uses to Bound Volume Uses Per Study Volume
Arts & Humanities	28.37	7.33	3.87
Life & Health Sciences	115.41	121.63	0.95
Physical Sciences & Eng	23.56	27.24	0.86
Social Sciences	40.52	21.62	1.87
Grand Total	207.86	177.82	1.17

Overall, each unbound issue of a journal included in this study received 1.17 uses for each use of a bound volume of the same journal. Given that each bound volume represents several issues, this finding does not provide strong support for the theory that the most recent unbound issues of journal titles are more intensively used than older, bound issues. The titles serving the scientific disciplines traditionally characterized by intensive use of current publications show the lowest ratios of unbound/bound use, while titles in the arts and humanities have substantially higher ratios of unbound to bound use (3.3 times the overall ratio). However, because the number of arts and humanities titles in this study was relatively small and the study itself was not specifically designed to acquire reliable data on bound/unbound use of print journals, little importance should be attached to this finding.

CMI staff initially had planned a hands-on special study to examine each study title in digital and print form against a standard list of typology and content features. CMI staff met with a group of UC librarians to refine the list of journal characteristics that could be examined. A list of characteristics at the title, issue, and article levels was compiled (Appendix P). CMI staff gathered data about the study titles from the Institute for Scientific Information (ISI) Journal Citation Reports (JCR) 2000. Specifically, staff gathered the ISI impact factor, immediacy index, number of articles, total cites, and cited half-life. Since the JCR focus is on science and social science journals, statistics for many, but not all, of the CMI study titles were available. After discussion with the Research Advisory Committee, CMI staff decided that the substantial work involved in inspecting and classifying some 300 journals using the data categories outlined in Appendix P would be

¹⁷ JSTOR is a nonprofit organization that converts the back issues of important and widely-held paper journals into electronic formats in order to allow savings in library space while simultaneously improving access to the journal content. JSTOR journals are digitized from their initial year of publication up to a “moving wall,” generally 3-5 years prior to the current issue. Through the moving wall, JSTOR seeks to avoid jeopardizing publishers' subscriptions and revenue opportunities from current and recent material, while also enabling libraries and researchers to rely on JSTOR as a trusted archive, providing both preservation and access for journals after a reasonable period of time. Forty-four of the titles in the CMI Journal Use Study are JSTOR titles (see Table 1).

justified only if results from the User Preference Survey indicated that any single characteristic might be a key factor in usage of print versus electronic journals. Accordingly, CMI staff decided this study would not be undertaken as part of the CMI project. However, further information about journal characteristics was solicited from publishers of the journals in the CMI study; the results are also provided in Appendix P.

Finally, because the frequency and duration of system outages could affect electronic journal usage, CMI staff tracked such interruptions through CDLALERT-L, an email list that disseminates information about the CDL systemwide server and network downtime.

During the journal usage study year, CDLALERT-L issued eight notices initiated by three publishers involved in the CMI study (Table 12). These notices warned of approximately 286 hours of downtime due to the publisher server maintenance/repair or publisher-side connectivity issues.

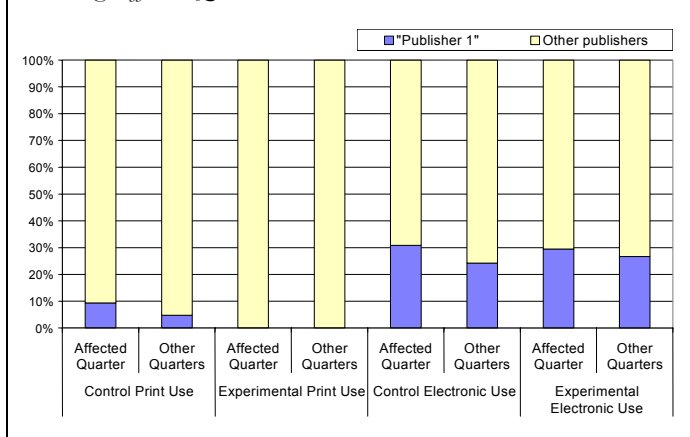
Table 12: Publisher-Reported System Outages Affecting CMI Study Titles

Publisher	Number of Alerts Issued	Hours System Affected
"Publisher 1"	3	254
"Publisher 2"	4	25
"Publisher 3"	1	7
Total	8	286

The CMI study examined publisher usage data for the quarter most affected by system outages. Publisher 1 had

252 hours of partial or full system outages during the third quarter of the study. One might expect that Publisher 1's electronic journal usage for that quarter would decrease as a percentage of total electronic journal usage; however, the opposite was true. Usage at the campuses studied comprised 45 percent (control site) and 42 percent (experimental site) of total electronic journal usage during the affected quarter. During the other three quarters, Publisher 1 usage comprised 32 percent (control campus) and 36 percent (experimental campus) of total electronic usage (Figure 8). The use of print journal

Figure 8. Effect of "Publisher 1" System Outage on Journal Usage During Affected Quarter



versions at the control campus during the affected quarter, when measured as a percentage of all control journal uses, was double (10 percent) that of the other three quarters (5 percent). In contrast, there were no uses of this publisher's print journals at the experimental campus during the affected quarter.

Data from the Journal Use Study were subjected to a great variety of additional statistical analyses to determine what factors might influence rates of use of digital journals and their print counterparts. The factors included in these analyses included the subjects of the journals, the publisher/provider, and the location of the use (control or experimental, and the specific campus where the use occurred). The use data themselves were subjected to a variety of manipulations, including logarithmic and exponential transformations and computations of print/digital use ratios and of use per physical volume and per publication year, in an attempt to normalize the data and

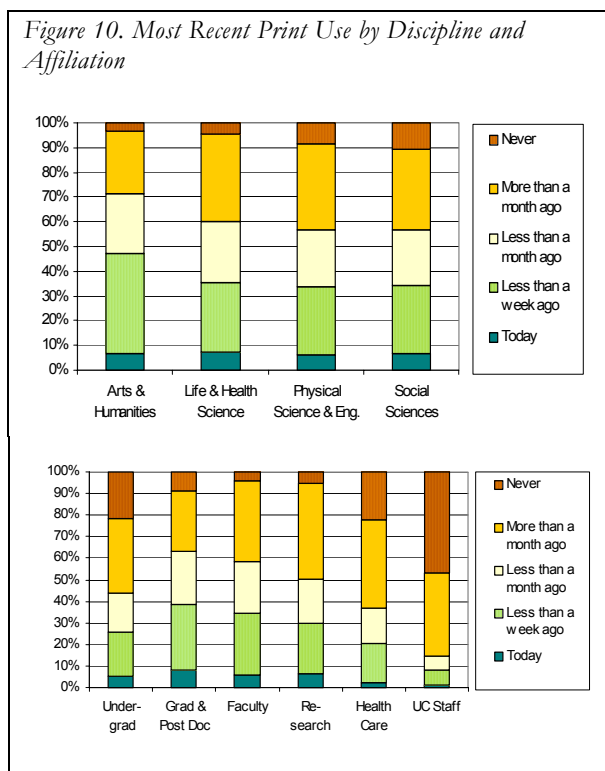
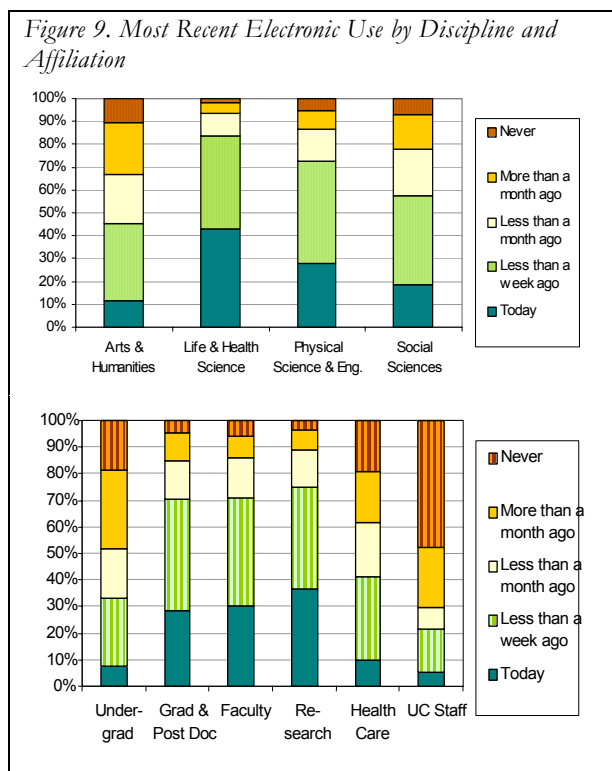
isolate statistically significant patterns. No clear and readily interpretable patterns emerged from these preliminary analyses.

4.1.2. Findings from the User Preference Survey

Findings from the User Preference Survey reported in this section use the weighted values described in Section 3.2. For a complete tabulation of survey results using unweighted data, see Appendix Q. As a result of the large sample size for the User Preference Survey, most crosstabulations of responses with the demographic characteristics of respondents (University affiliation, discipline, age, etc.) were statistically significant (as measured by the probability value of the Chi-Square statistic), but few displayed a strong relationship. In the discussion that follows, differences in responses by affiliation and discipline are displayed and discussed only when these are both statistically significant and reasonably strong, as indicated by a Cramer's V statistic (a measure of strength of relationship for categorical data) greater than 0.1.

Data from the User Preference Survey showed that digital journals were generally popular and frequently used. For all respondents, 37 percent had used a digital journal within a week of the Survey, while 22 percent had used a print journal within the same period. For faculty, graduate students, and research staff, the difference was more dramatic — 68 percent had used a digital journal within a week of the Survey, while 35 percent had used a print journal (see Figure 9 and Figure 10).

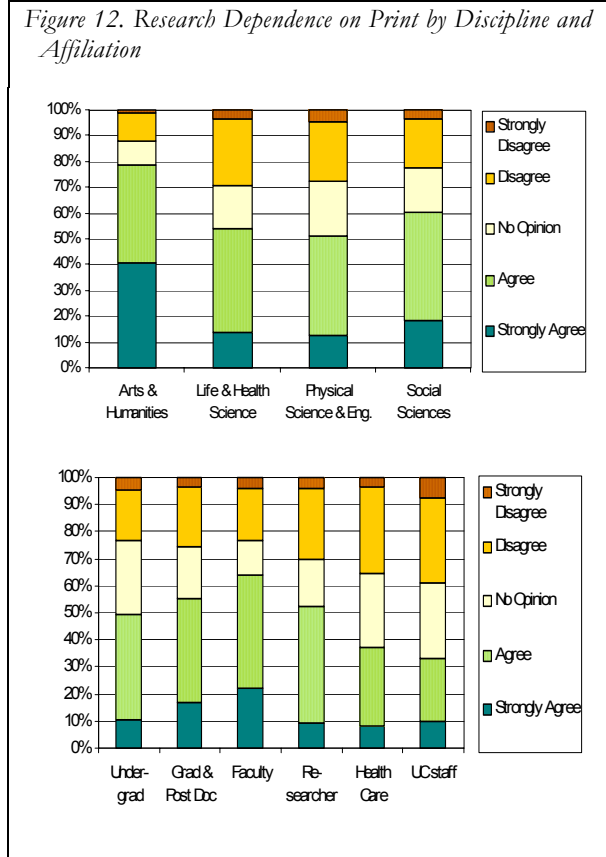
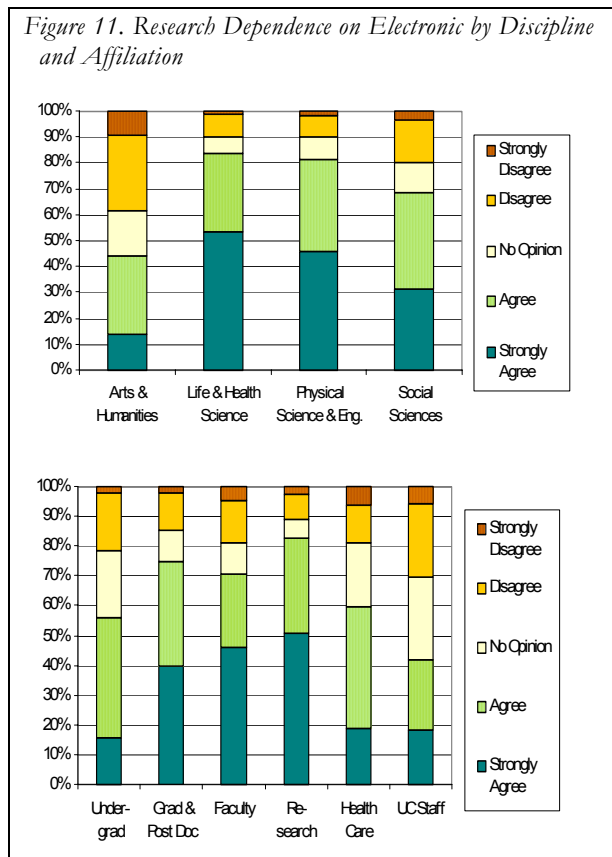
Survey results show some differences by discipline, however. For the use of print journals, approximately 35 percent of respondents in the sciences and social sciences had used print within a week, whereas 45 percent of those in the arts and humanities had. A more obvious trend was



apparent in use of digital journals, with life and health science respondents reporting the most recent use, followed by the physical sciences and engineering, social sciences, and arts and humanities. Undergraduate respondents tended not to be recent users of either print or digital journals, although they were more likely to report recent use of digital journals than of print.

Respondents also reported that research in their disciplines has become dependent on electronic journals. Overall, 54 percent of respondents agreed or strongly agreed with the statement “Research in my field is dependent on the library’s electronic journals.” However, the strength of this view varied by the respondent’s University and disciplinary affiliations. Faculty, graduate students, and research staff believed similarly in the research importance of electronic journals, with rates of agreement ranging from 70 to more than 80 percent. Among academic disciplines, life/health science respondents were most likely to agree (83 percent), followed by physical sciences (81 percent), social sciences (68 percent) and arts and humanities (44 percent). However, even among arts and humanities respondents, only 38 percent disagreed or strongly disagreed with the statement (see Figure 11).

The emergence of digital journals did not, however, appear to undermine the importance of print journals. About 25 percent of the respondents said their research was not dependent on print; this result did not vary appreciably by University affiliation (Figure 12). Among faculty and graduate students, however, there were variations by disciplinary affiliation; 29, 27, and 22 percent of life scientists, physical scientists, and social scientists, respectively, indicated their work did not depend on print journals. Not surprisingly, only 12 percent of respondents from the arts and humanities indicated their work did not depend on print. In fact, there is a strong statistical correlation between



print and digital use¹⁸. As shown in Table 13, for example, 64 percent of those who said they had used a print journal today had also used an electronic journal today.

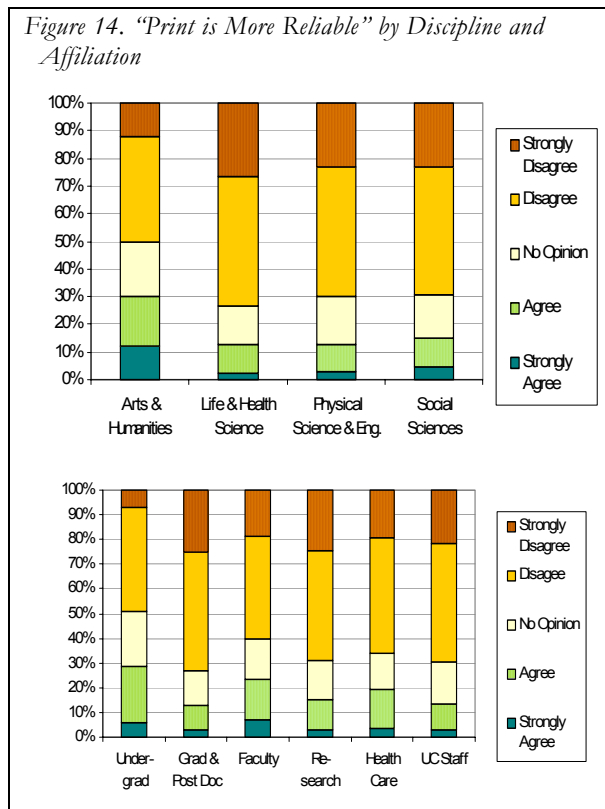
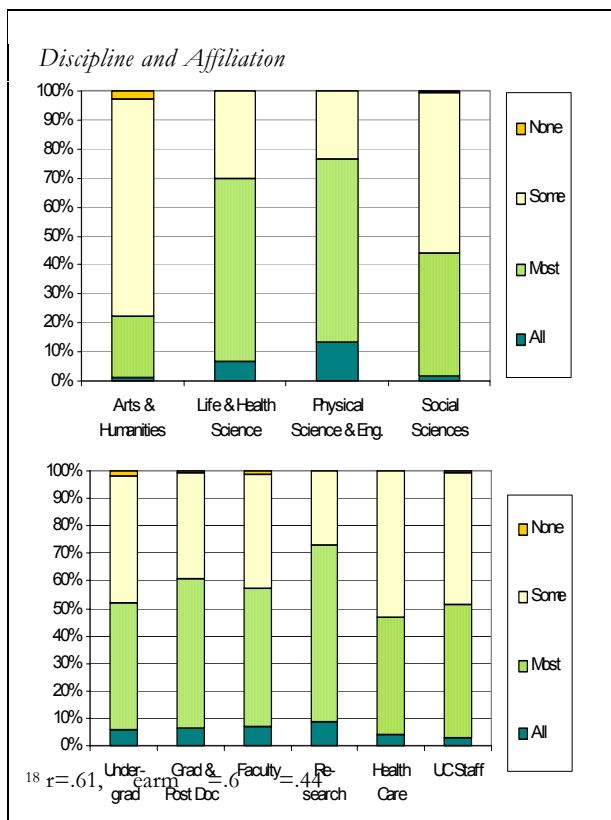
A majority of respondents (54 percent of those whose response was other than “Don’t Know”) reported that all or most of the key journals in their fields were available in digital form. This response did not vary greatly by University affiliation, except for research staff; 73 percent of who felt that all or most of their journals were available. Responses

were, however, sharply different by discipline, with those who felt all or most journals were available electronically ranging from 75 percent in the physical sciences to only 21 percent in the arts and humanities (Figure 13). These overall results are consistent with those from a recent study of the citations included in theses and dissertations written by University of Georgia graduate students in 2001 (Smith, 2003). In that study, 57 percent of journal articles cited were determined to be available in electronic format. However, disciplinary differences in that study were less marked, ranging from 40 percent in arts and humanities to 66 percent in the social sciences.

One frequently voiced concern is that, owing to temporary system disruptions or long-term uncertainties about their archival durability, electronic journals cannot be relied upon as readily as

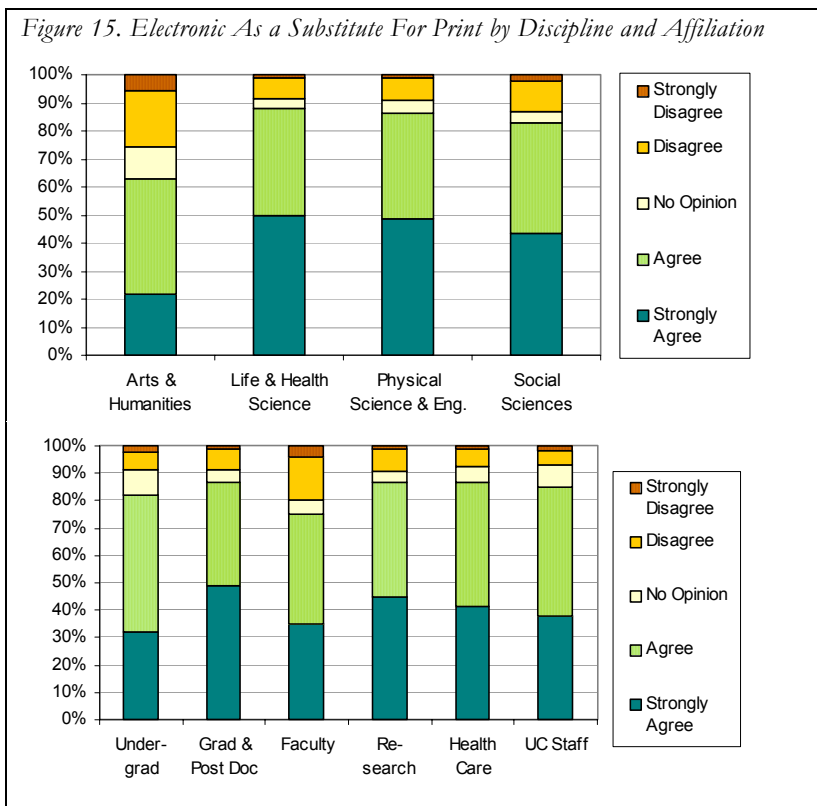
Table 13. Relationship Between Recency of Use of Print and Digital Journals

Last time e-journal from univ library used	Last time print journal from univ library used					Total
	Today	Less than a week ago	Less than a month ago	More than a month ago	Never	
Today (Column %)	2,890 63.79	3,158 17.14	2,356 14.4	2,704 7.08	806 2.85	11,913
Less than a week ago (Column %)	828 18.28	11,046 59.97	4,927 30.13	8,658 22.68	1,727 6.11	27,187
Less than a month ago (Column %)	465 10.26	1,715 9.31	6,361 38.9	5,872 15.38	1,477 5.23	15,890
More than a month ago (Column %)	78 1.71	1,973 10.71	2,081 12.72	16,190 42.41	3,968 14.04	24,289
Never (Column %)	270 5.95	528 2.87	630 3.85	4,754 12.45	20,295 71.78	26,477
Total	4,530	18,420	16,355	38,179	28,273	105,756



their print counterparts. To assess the extent of these concerns, respondents were asked to agree or disagree with the statement, “Even if both are available, I think print journals are more reliable than electronic journals.” A majority of respondents (58 percent) disagreed with this statement, a response that did not vary appreciably by University affiliation. Among faculty and graduate students, 69 percent disagreed, a proportion that was similar for all disciplinary groups except the arts and humanities, where 50 percent disagreed. (Figure 14). It should be pointed out, however, that this question is somewhat ambiguously worded: in the minds of respondents, “reliable” could refer to archival persistence, the system reliability of the ejournal provider or of the network, or the quality and completeness of an online article.

Another key concern is the willingness of the academic community to accept digital journals as substitutes for their print counterparts. The survey asked respondents to agree or disagree with the statement, “Electronic journals are a suitable alternative to print journals.” Overall, 82 percent of respondents agreed with this statement, a rate that did not differ appreciably by University affiliation. However, faculty and undergraduate students were somewhat less likely to agree with the statement. Responses by discipline followed the usual ordering for this survey, with life scientists most likely to agree (88 percent) and faculty and graduate students in the arts and humanities least likely to agree. However, even among this latter group, 63 percent agreed that electronic journals were a suitable alternative to print (Figure 15).



In addition, we asked respondents what they would do if a print journal they wanted to use were

Table 14. Preferred Alternatives When Print Journals are Not Available (%)

Survey Question 9: “When you decide to use a print journal and find that it is not on the shelf in the campus library, how likely is it that you:	Very Likely	Likely	Unlikely	Very Unlikely	N/A	Total
Go online and use the electronic version as a substitute for the print.	46.1	30.8	10.6	4.5	8.0	100.0
Decide not to use the journal.	16.3	40.0	23.2	11.4	9.1	100.0
Use Interlibrary Loan (ILL) or library document delivery service.	13.4	25.9	31.4	19.9	9.4	100.0
Decide to use an off-campus public or academic library where you expect the print is available.	8.8	29.9	28.2	25.1	8.0	100.0
Find an alternate source for the journal such as a departmental or colleague's collection.	7.9	42.2	25.1	16.1	8.7	100.0
Take out a personal subscription to the journal.	1.7	6.1	25.8	59.0	7.4	100.0

not available in their campus library (Table 14). The leading response was to use the electronic version (77 percent rated this alternative “Very Likely” or “Likely”), followed by simply not using the journal (56 percent). The distribution of these responses did not differ substantially by University or disciplinary affiliation.

4.2. ADVANTAGES OF DIGITAL JOURNALS

The survey asked respondents whether they preferred print or electronic formats for a variety of common tasks. As shown in Table 15 and Figure 16, a majority of respondents either definitely or mostly preferred electronic journals when searching for

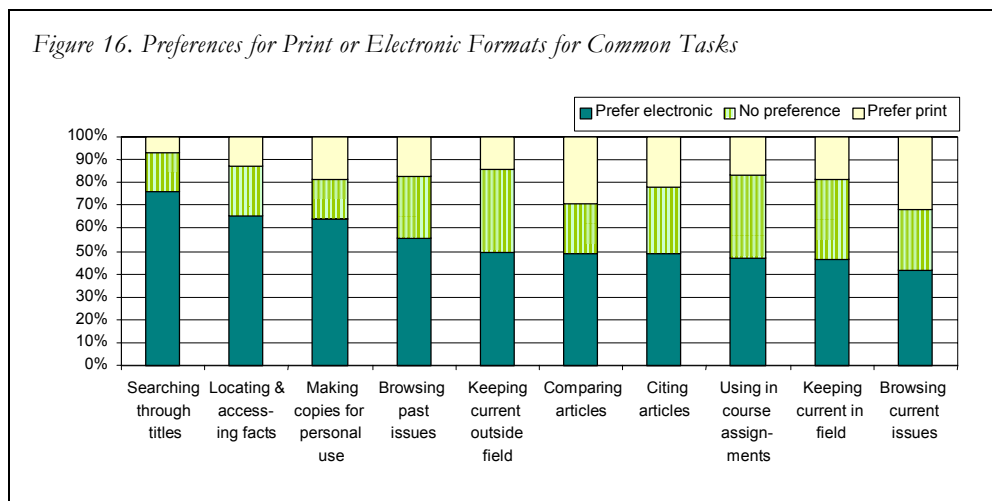
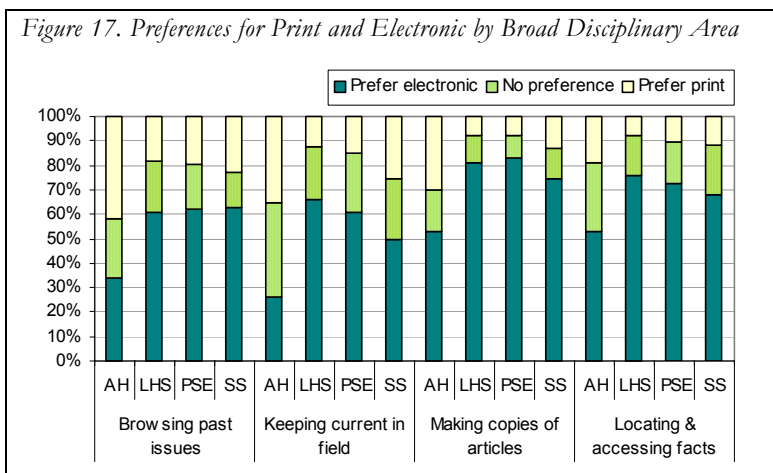


Table 15. Preferences for Print or Electronic Journals for Common Tasks

Question 6: Print and electronic journals may be used in different ways. If both versions were equally available, would you prefer to use print or electronic for the uses described below? Please mark the option that best describes to your preference.	Percentage Who Definitely or Mostly Prefer Electronic Journals (%)	
	All Respondents	Faculty, Researchers and Graduate Students
When searching through several different journal titles for articles.	78	82
When I need to locate and access specific facts.	65	70
When making copies of journal articles for my personal use.	61	77
When browsing past issues of a journal.	54	59
When I need to cite articles.	47	63
For use in course assignments.	47	49
When comparing and contrasting several articles at once.	46	52
To keep current outside of my (field, area, discipline, specialty).	45	54
To keep current in my (field, area, discipline, specialty).	44	56
When browsing current issues of a journal.	40	46

articles, locating facts, making copies, and browsing past issues. An even stronger preference for electronic formats was reported by faculty, graduate students, and research staff, who also preferred electronic formats for citing, comparing and contrasting, and keeping current (either inside or outside their academic fields). A minority preferred electronic journals for browsing current issues and use in course assignments.

In some cases, there were substantial differences by University or discipline affiliation in preferences for print or digital journals. For example, as shown in Figure 17, faculty and graduate students in the arts and humanities showed less preference for electronic versions for browsing past issues, although only a minority (42 percent) expressed an exclusive preference for print. For keeping current in their field, making copies, and citing articles, the moderately diminished preference for digital versions by respondents in the arts and humanities was nearly matched by the responses of the social sciences.



As shown in Figure 18, the responses of graduate students and faculty were marked by stronger preferences, both for print and for digital, than those of undergraduates, while researchers tended to prefer the electronic versions. For making copies, citing articles, and using in course assignments, undergraduate students displayed somewhat less preference for digital versions.

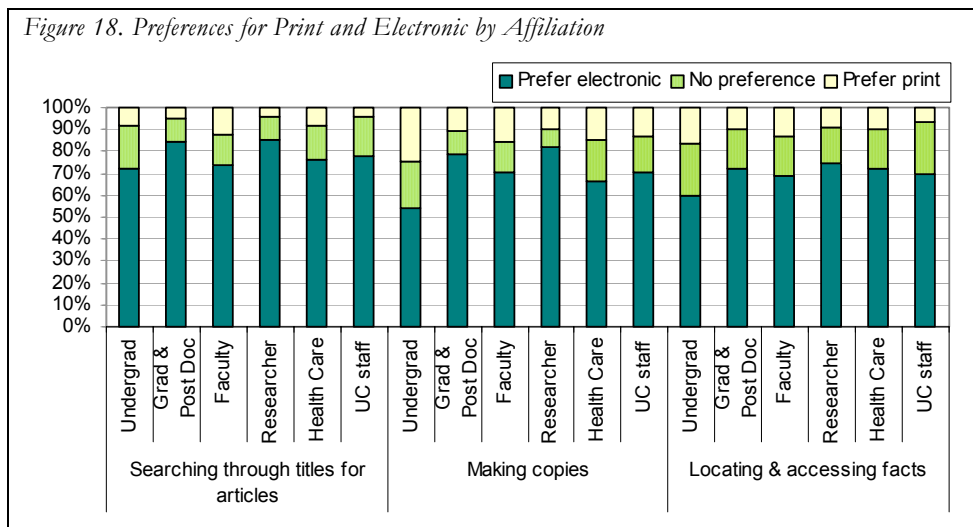


Table 16. Reported Advantages of Electronic Journals

Question 7a: Electronic versions of journals may have advantages for some users. Please tell us how important for you are the following characteristics of electronic journals:.	Percentage Who Find This Feature Important or Very Important (%)	
	All Respondents	Faculty, Researchers and Graduate Students
Electronic journals are always available – 24 hours a day every day	94	96
In using electronic journals I don't have to go to the library or wait for document delivery.	93	95
Electronic journals contain hyperlinks to other articles and related information.	88	82
Electronic journals include data which can be downloaded for use.	84	77
Using electronic journals avoids photocopy costs for print articles.	75	80
Articles are available in electronic form before they are published in print.	61	65

In addition to the substantial preference for electronic formats discussed above, a majority of users strongly favored the convenience features of electronic journals, including guaranteed 24x7 availability (e-journals are never checked out to another user and the digital library is rarely closed), access without having to go to the library, the inclusion of hypertext links and downloadable data, the avoidance of photocopy costs, and the availability of digital articles prior to publication of the print equivalent (see Table 16 and Figure 19). All demographic and disciplinary groups shared this appreciation for the convenience of electronic journals, although there were some minor differences by disciplinary affiliation with the value attached to avoiding visits to the library (Figure 20); this attribute was more important to respondents in the sciences.

Figure 19. Importance of Some Advantages of Electronic Journals

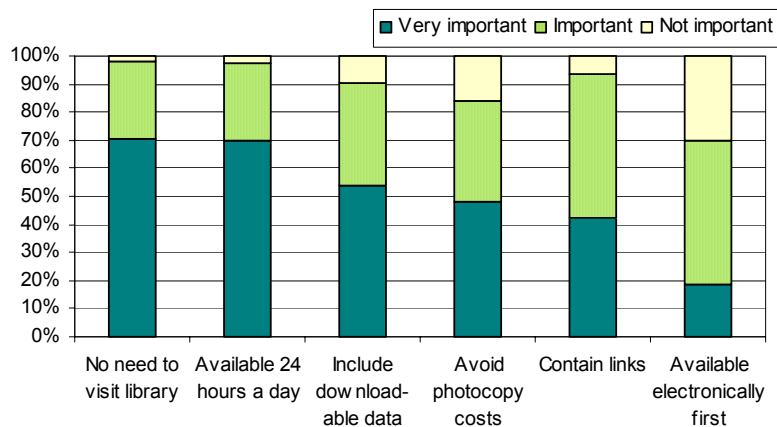
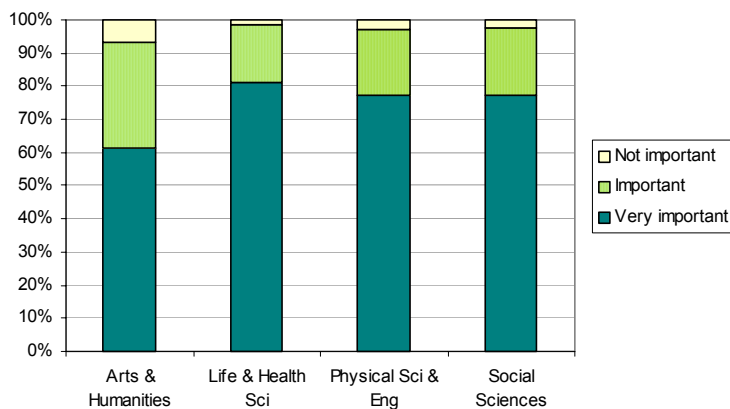


Figure 20. Identification of "No need to visit library" as an Advantage, by Broad Disciplinary Area



In addition, of the 7,220 survey responses received, 2,345 respondents provided additional comments on the advantages of or barriers to using digital journals. Of these, 1,705 comments addressed additional advantages of digital journals, and 1,271 addressed barriers to their use (these sum to more than 2,345 because some respondents commented on both advantages and barriers). CMI staff classified these comments into 29 categories, as shown in Table 17; because a single comment could address multiple categories, the totals shown here exceed the number of comments received.

With regard to the advantages of digital journals, 17 percent of respondents (399 of the 2,345 respondents who offered comments) mentioned the convenience of digital journals, with 385 citing advantages and 14 identifying barriers. No category of survey comments garnered a greater number of responses.

Additional advantages cited by significant numbers of

respondents included the ease of integration with personal library management software (256 respondents), conservation of natural resources such as paper (173 respondents), and the ease with which electronic journal articles could be shared with colleagues (166 responses) (see Table 17).

4.3. PROBLEMS AND BARRIERS IN THE USE OF DIGITAL JOURNALS

Certain characteristics of the electronic versions of scholarly journals discouraged users from viewing them as adequate substitutes for their print equivalents. The factors most often mentioned in the interviews used to help design the User Preference Survey (see Section 3.1.1) include incompleteness (e.g., absence of letters, advertisements, and other “non-editorial” content), missing articles or issues, inadequate graphics, difficulty reading from the screen or printing, and technical problems, including problems with computers and networks. To assess the importance of these

Table 17. Categorical Summary of Comments Received from Questionnaire Respondents

Keywords	Keyword Application	Advantages	Barriers	Total
convenience	ease of availability, often but not always coupled with a savings in time as in "efficient".	385	14	399
subscription	Requests for MORE, print or digital. Often contain specific titles.	18	343	361
copy quality	Aspects (ease/difficulty/other) of making either an electronic or a print copy, quality of color and graphics in both print and digital copies.	246	100	346
endnote.	Personal library management (PLM) and the functionality that having such a personal library application affords including archiving and highlighting.	256	17	273
content	Comparability, quality, current or older content	87	152	239
library	Service, policy or collection comments directed at the library	48	187	235
technology	Quality of computing equipment, or network connection at both the personal and the library level.	13	209	222
efficient	Used where a distinction is made between time saved and at hand/location convenience, as in comments of fast, quick, speed, time saver.	213	7	220
discovery	Act of using the catalogue, index, database and other search and find comments. Full text searching was included under "word search" as distinct form of discovery.	130	87	217
conservation	Saving trees, paper or other resources	173	3	176
sharing	Making print or digital copies for the express purpose of giving them away.	166	6	172
word search	Full text searching using a variety of techniques and tools distinct from using the library catalog or databases.	152	8	160
reading	The act of reading in the present or future in either print or digital media.	66	53	119
cost	Specific mentions of additional or avoided costs.	49	47	96
portability	Distinct from general "convenience" in that travel, working from remote sites or lugging heavy books is specified.	81	7	88
teaching	Class use, lectures, seminars, presentations, often coupled with the "reuse of graphics".	80	6	86
links	Use of or value of links.	45	32	77
training	Requests for or lack there of	6	60	66
citation	The act of citing, difficulty with citing, lack of pagination for citing, instances where cite, citing or citation were present.	36	23	59
relevance	Comments that revealed methods, ease, or difficulty in determining the relevance of an article to the individuals search criteria.	40	2	42
OVID	Specific system mentions.	2	36	38
abstract	Using or the quality of abstracts.	17	19	36
reuse graphics	Describes ways that graphics maybe reused, both in digital and print formats such as PowerPoint presentations and distinct from PLM.	29	3	32
JSTOR	Specific company mentions.	7	22	29
CDL	Mentions of CDL services or collections.	1	27	28
reliability	Not on the library shelf or server down.	5	11	16
space savings	Office filing, hard disk storage, shelf or desk space associated with keeping journal articles in either format.	16	0	16
CMI	Comments on survey design or methodology.	5	5	10
comparing	The act of comparing multiple items.	3	3	6
TOTALS*		2375	1489	3864

*Totals here exceed the total number of comments received, as a single comment could include multiple concepts.

concerns, the survey asked questions about three types of possible problems: availability of content, ease of use, and computer-related issues.

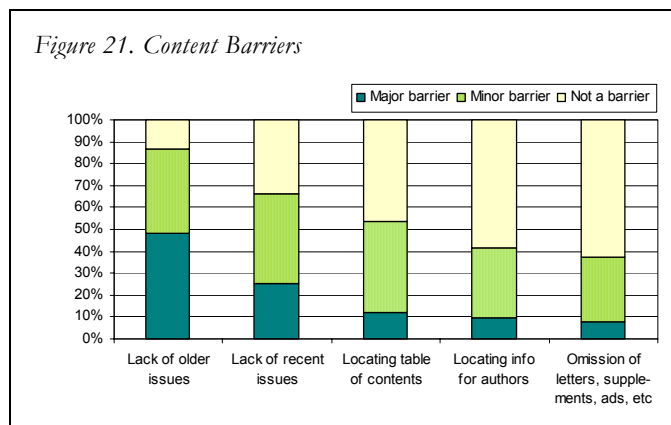
4.3.1. Content

The survey asked five questions about the availability and accessibility of journal content. As shown in Table 18 and Figure 21, by far the greatest barrier perceived by users was the unavailability

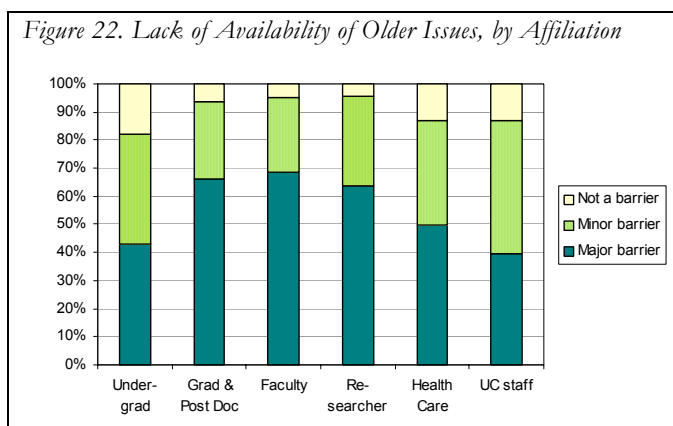
Table 18. Content Barriers to the Use of Electronic Journals

Question 8b: Please indicate to what extent you have found the availability of content to be a barrier to using electronic journals	Percentage Who Find This a Major or Minor Barrier (%)	
	All Respondents	Faculty, Researchers and Graduate Students
Unavailability of older issues of journals in electronic form.	76	92
Unavailability of most recent issues of journals in electronic form.	56	56
Locating and accessing the table of contents in electronic journals.	45	39
Locating publication information for authors in electronic journals.	33	24
Omission of letters, advertisements , editorial information or supplements from the electronic version.	31	24

of journal back files, identified by 75 percent of all respondents and more than 90 percent of faculty, graduate students, and researchers. A majority also indicated that availability of the most recent issues of e-journals was a barrier to use. Although evidence from the UC campuses suggested that the publishers included in the CMI Journal Use Study (Table 1) posted the most recent issues of their journals to their Web sites promptly, our users' experience with a wider range of journals and publishers was considerably more varied.

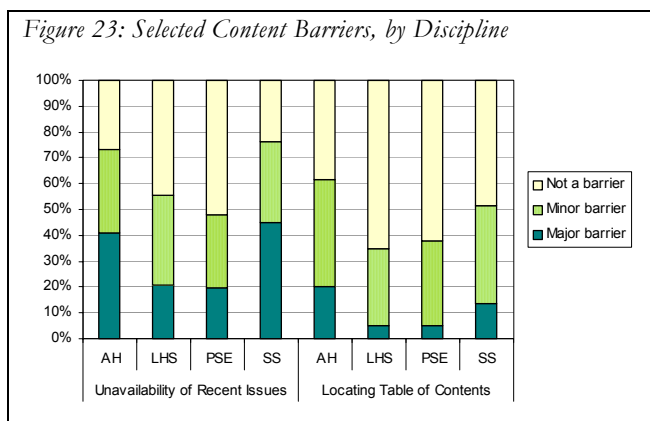


Observing the difference between all respondents and the faculty and graduate students to the question about the unavailability of older issues (Table 18), it was not surprising that the research-oriented group, joined by health care professionals, felt more strongly about lack of access to electronic journal back files as a barrier (Figure 22).



The perception that unavailability of the most recent issues represented a barrier, by contrast, varied among disciplines within the "research group." Respondents from the arts and humanities and social sciences were more likely to

identify this as a major barrier, perhaps reflecting differences in the provision of digital back files by publishers outside the sciences (Figure 23). It is also possible that, because the JSTOR electronic journal collection contains extensive digital backfiles of key journals in the social sciences, arts and humanities, respondents are reacting to the “moving wall” policies of the JSTOR collection that can result in an absence of digital access to the most recent issues of the journals it provides.¹⁹ However, at the time of the study, JSTOR provided only about 200 (see Table 1) of the 6,000 or more titles available in the UC shared digital journal collection, so it is not evident to what extent the characteristics of JSTOR contribute to this finding.



Interestingly, these same disciplinary groups were more likely to feel that the ability to locate the table of contents in an electronic journal publication was also a major barrier, perhaps reflecting differences in digital publishing practices among the disciplines or differences in the respondents’ experience and skill in navigating electronic publications.

Finally, comments from 343 survey respondents indicated that the lack of library subscriptions to the electronic formats of the journals they most used was a barrier (see Table 17).

4.3.2. Usability

Table 19. Usability Barriers to Use of Electronic Journals

Question 8a. Please indicate to what extent you have found the following to be barriers to your use of electronic journals.	Percentage Who Find This a Major or Minor Barrier (%)	
	All Respondents	Faculty, Researchers and Graduate Students
Reading electronic journals on the computer screen.	59	70
Highlighting sections or making marginal notes in electronic articles.	59	59
Printing charges for electronic articles when using campus computer labs, libraries or departmental services.	59	42
Accurately reproducing color illustrations from electronic articles.	50	42
Printing graphics from electronic articles at a quality suitable for research.	47	41
Moving between parts of an electronic article (for instance from text to graphics, to references).	46	51
Dealing with several different formats (PDF, HTML etc.) with different access and use modes.	46	36
Working with distinctive features of articles such as maps, illustrations or non-roman characters included in the electronic version.	45	40

The survey asked respondents eight questions about the general usability of digital journals. As shown in Table 19 and Figure 24, while reading on the screen, highlighting, and printing charges

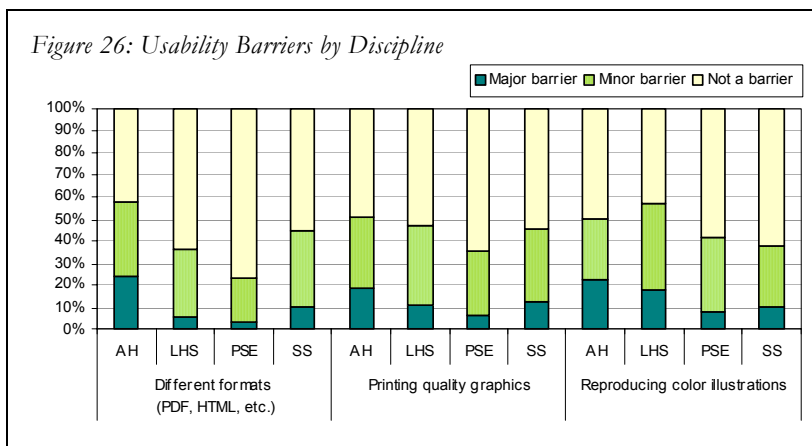
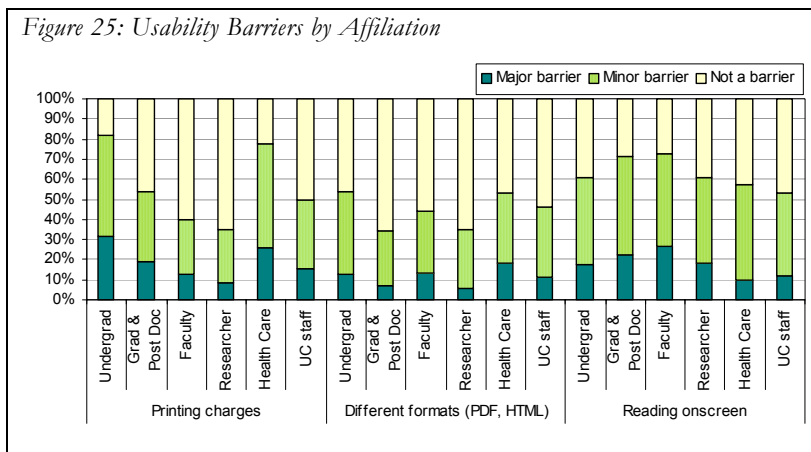
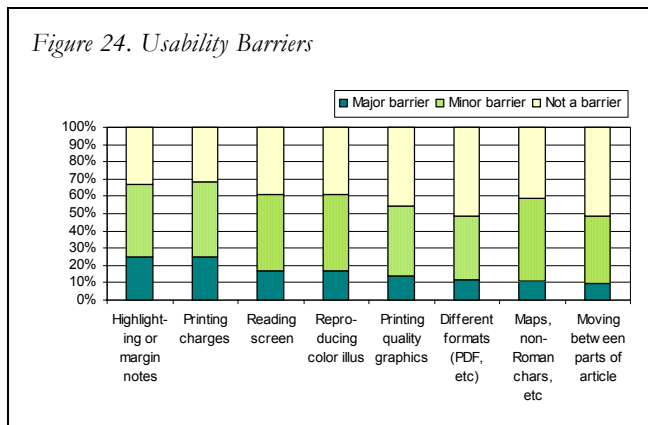
¹⁹ See Note 17 above for a description of JSTOR and the “moving wall.”

were the barriers most frequently mentioned, all eight factors were perceived as barriers by many respondents, ranging from 45 to 59 percent of all respondents and from 36 to 70 percent among faculty, graduate students, and researchers.

As suggested by Figure 25, there was a noticeable difference in the views of various demographic groups about the ease of reading on the screen, with faculty and graduate students more likely to identify this as a barrier. In addition, undergraduates and health professionals were more likely to perceive dealing with different electronic formats as a barrier. Perhaps not surprisingly, undergraduates were more likely to feel that printing costs represented a barrier, a view shared by health professionals.

Dealing with the various formats of electronic journals was viewed differently according to disciplinary affiliation, with respondents in the arts and humanities and social sciences more likely to report this as a barrier (Figure 26). These disciplinary groups also tended more frequently to report difficulties with printing graphics and color illustrations.

However, while 346 respondents provided comments on printing and copy quality, 246 of these were comments on the advantages of digital journals in producing high-quality print copies, especially in comparison to photocopies of print journals produced on typical library copiers.



4.3.3. Computers and Telecommunications

Because electronic journals depend on computers and telecommunications networks for access and display, the survey asked seven questions about computer equipment, network access, and computer skills and training. As shown in Table 20 and Figure 27), the primary barrier experienced by respondents was gaining access to the library's online journals from off-campus locations, followed by the speed and reliability of home Internet services. The quality and performance of computer equipment, whether at home, in

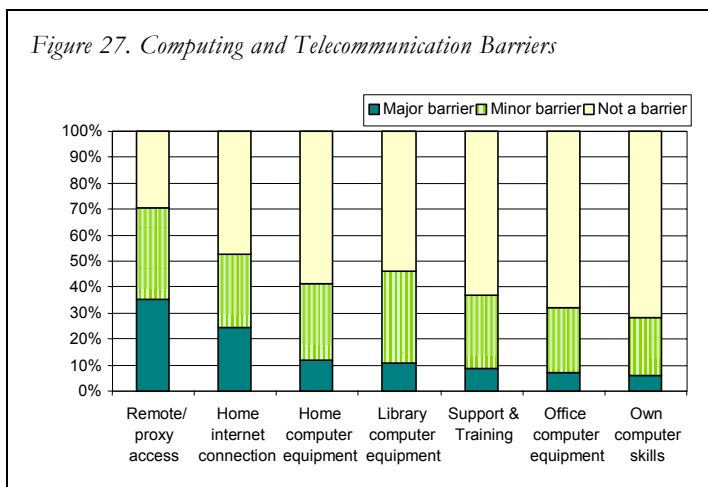


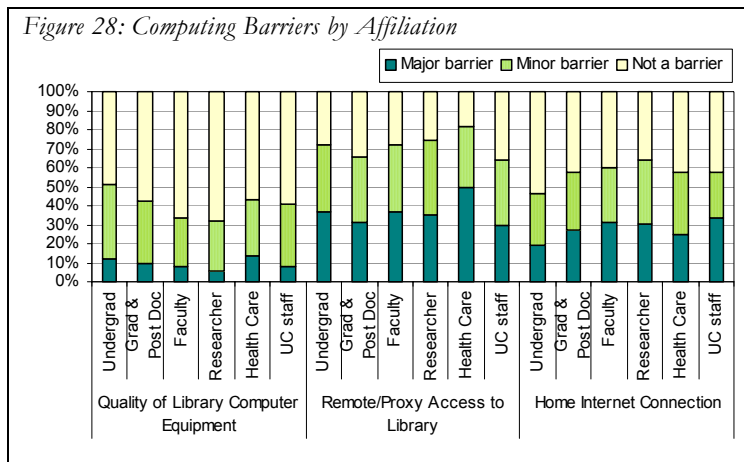
Table 20. Computer and Telecommunications Barriers to Use of Electronic Journals

Question 8c. Please indicate to what extent you have found these computing issues to be a barrier to your use of electronic journals	Percentage Who Find This a Major or Minor Barrier (%)	
	All Respondents	Faculty, Researchers and Graduate Students
Getting access to the library's online journals from off-campus locations (Proxy Server/Authentication problems).	59	60
The speed and reliability of my home Internet connection.	48	54
The quality or performance of my home computer equipment.	38	38
The quality , performance or availability of library computer equipment.	37	30
Quality of computer support and training available to me.	33	25
The quality or performance of my office computer equipment.	27	24
My own computer skills .	27	23

the office, or in the library, and computer skills and training, were mentioned by a smaller number of respondents (28 to 38 percent), but this number is large enough that it should not be ignored.

As shown in Figure 28, undergraduate students and faculty were more likely to perceive remote access to online journals as a barrier. Undergraduates were less likely to report that the speed of home Internet connections was a problem, perhaps because many have high-speed access to campus networks through dormitory connections or are more likely to rely on on-campus computers than home equipment. Indeed, undergraduates were more likely than

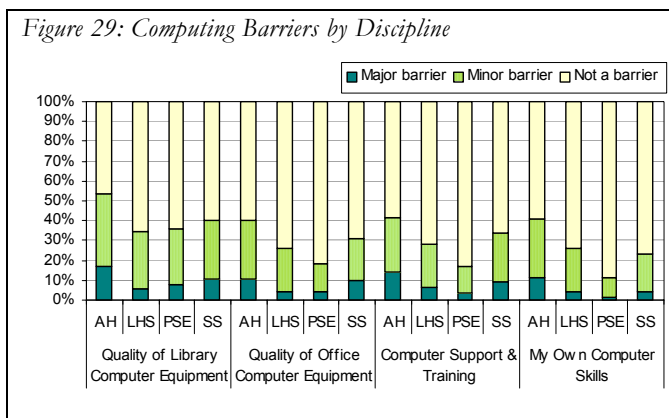
Figure 28: Computing Barriers by Affiliation



other groups to believe that the quality of their library’s computer equipment represented a barrier to access.

Faculty, graduate students, and research staff in the arts and humanities and the social sciences were more likely to feel that the quality of the computer equipment available in their offices and in the libraries presented barriers to the effective use of electronic journals (Figure 29). These same disciplinary groups were more likely to perceive that their own computer skills and the quality of computer support and training available to them presented obstacles.

In addition, 209 respondents added comments regarding technology barriers to their use of electronic journals. While the comments generally were similar to the categorical responses discussed above, the fact that so many respondents elected to add comments in this area (second only to lack of library subscriptions to needed electronic journals in comments related to barriers – see Section 4.3.1 above) showed this was a source of considerable frustration for a significant number of users.



5. THE COSTS AND TRADE-OFFS OF ALTERNATIVE METHODS FOR MANAGING AND STORING PRINT JOURNAL COLLECTIONS

To address the project objective of documenting the costs incurred and avoided when print copies of journals are relocated to a storage facility and the electronic versions are primarily used, the CMI project engaged Professor Emeritus Michael Cooper of the School of Information Management and Systems at UC Berkeley. Professor Cooper, who developed the cost modeling component of the proposal for this project, reviewed the cost and use data collected during the CMI study, as well as other relevant data from UC institutional sources and published literature to develop a set of cost models and unit-cost estimates that could be applied to the analysis of alternative storage programs. Professor Cooper's final report, included in Appendix R, documents the cost elements in the models, the sources of costs used in evaluating the models, and the estimated costs and trade-offs for five alternative storage programs, as well as the costs for maintaining electronic subscriptions. This section of the report summarizes and provides additional interpretation of Professor Cooper's findings.

The primary focus of the CMI was to "suggest future strategies and policies for managing print journal collections with digital counterparts." The models developed here were tailored to that goal. They assume that libraries subscribe to journals in both print and digital formats, and focus on the analysis of costs and trade-offs for alternative methods of managing print journals.

5.1. COST ELEMENTS AND UNIT COST ESTIMATES

The cost elements addressed in this study fall into the following major categories:

- **Storage (construction) costs** to construct and equip facilities for housing print journals, either in on-campus library stacks or off-campus storage facilities. The cost per volume to construct both on-campus library facilities and off-campus storage facilities was estimated using data for eight recent library construction projects at the University of California, including one regional library storage facility. Based on these sources, it was estimated that the cost of storing a volume in an on-campus library was \$1.43 per year, and in an off-campus regional storage facility, \$0.33 per year. While there are also storage costs for electronic journals, these costs are borne by the publisher/vendor that hosts the journal content, and therefore included in the subscription price, or are part of the institution's overall cost for computing and networking, and cannot be easily attributed to the provision of access to electronic journals.
- **Acquisition costs** for print and electronic journals, including annual subscription costs. For the purposes of this study, as discussed above, it was assumed that all journal titles were already selected and acquired in print and digital formats, so the administrative costs of acquisition, initial cataloging, and negotiation of licenses for digital formats were already expended and therefore irrelevant to this analysis. The major ongoing cost in this category was the annual subscription cost for both the print and electronic formats. The models developed here require separate estimates of the costs of print and electronic subscriptions, in order to estimate the savings that might accrue from the cancellation of print subscriptions and the reliance on electronic versions. However, publishers employ a variety of business models to price their print and electronic products, making it difficult to unambiguously identify the separate costs of the print and digital versions of their journals. For purposes of this study, information about the

total costs and print/digital allocations for the UC licenses for 15 major publishers was analyzed and averaged. On the basis of this analysis, Professor Cooper estimated that the average cost of a print subscription was \$952, and for an electronic subscription, \$530.²⁰

- **Processing costs**, including cataloging, check-in, marking, binding, and for off-campus storage, the costs of selecting, transporting, and reshelving materials, as well as the cost of updating bibliographic and inventory records. For the purposes of this study, it was assumed that processing costs for the normal maintenance of existing print and electronic subscriptions were “sunk costs,” and not relevant for this analysis; the exception was the cost of binding for print subscriptions, which was included as a cost element.²¹ Based on data provided by the UC Binderies, Professor Cooper estimated a cost of \$12.87 per volume for buckram bindings, and \$3.20 per volume for pamphlet boxes to house unbound volumes when the library or storage facility chose to forego permanent binding. The other major category of processing costs was that which included costs incurred for selecting and processing materials in campus collections for transfer to a regional library facility. Using data provided by the UC libraries as part of the process for selecting and processing materials for the Journal Use Study (see Section 2.2 above), and data on the cost of the University’s contract with a commercial courier service for the overnight delivery of library materials among the UC campuses, the following cost estimates for transfers to storage were developed: \$2.26 per volume for selection, \$0.71 per volume for record maintenance and other processing tasks, and \$0.60 per volume for transport of the selected materials to the regional storage facility.
- **Circulation costs**, including check-out, check-in, and reshelving for print materials, and the additional retrieval, transport, and handling costs for materials housed in off-campus storage facilities. While costs could be attributed to the use of electronic journals, these costs were either incurred by the publisher/provider hosting the journal content, or were included in the cost of institutional networking infrastructure, and were not considered in this analysis. The two relevant costs for the circulation of print materials are the average cost per circulation from on-campus library stacks, and for retrieval from an off-campus storage facility. For on-campus circulation, Professor Cooper estimated a cost of \$3.26 per transaction, based on studies conducted at the National Library of Medicine and at UC San Diego. For the cost of circulation from off-campus storage, he used data derived from UC sources for the planning and administration of the CMI project and from the National Library of Medicine to develop estimates of \$4.70 per transaction for loan of a physical item (including transportation), and \$3.94 for provision of a photocopy or electronic image of an article.

²⁰ Note that these cost estimates represent averages across a number of diverse license agreements among a number of major journal publishers. The actual savings that might be achieved by a particular institution for the journals of a particular publisher (e.g., specific “deep discount” prices for print subscriptions) should be evaluated on a case-by-case basis.

²¹ Note, however, that if a campus that currently received a print subscription to a journal chose to cancel that subscription and rely on the digital subscription, it would no longer incur check-in and records maintenance costs for that title. Because relevant and reliable data on these costs were not readily available, no estimate of these savings is provided in this analysis.

5.2. COST MODELS

Using the cost estimates described above, six basic cost models were developed for analysis (Table 21). Because continued access to the electronic version of a journal title is a constant in all the alternatives investigated, the first model represents the costs associated with electronic access; the remaining models represent varying treatments of the corresponding print version of the same title.

Table 21. Characteristics of CMI Cost Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Method of access to journal content	Electronic access only	Print access only	Print access only	Print access only	Print access only	Print access only
Initial status of printed copies of journals	NA	Retain at local library	Retain at local library	Retain at local library	Retain at local library	(See box below)
Final status of printed copies of journals	NA	Retain at local library	Move to storage facility	Discard after defined period	Move to storage facility	Sent directly from publisher to storage facility
Binding status of printed copies of journals	NA	Bind issues in Buckram	Bind issues in Buckram	NA	Store issues in pamphlet boxes	Store issues in pamphlet boxes

Table 22 shows the unit costs associated with each of these models. Because each model includes fixed costs (which do not vary as the number of uses of a title changes) and variable costs (which depend on the frequency of use of the title), the average cost per use of a title in each model varied according to the number of uses, as well as the subscription cost of the title. Figure 30 illustrates this for journals in electronic format (Model 1) for annual subscription fees of \$500, \$600, and \$700 per year (bracketing the estimated average subscription cost of \$530 discussed in Section 5.1 above). The figure shows that, for annual use rates ranging between 20 and 75 uses per year, average annual cost per use ranged between about \$35 (for 20 uses at \$700) and about \$7 (75 uses at \$500). Table 23 provides similar data for print journals using Models 2 through 6 and annual subscription costs of \$900 and \$1,000 per year (bracketing the estimated average subscription cost of \$952 discussed in Section 5.1 above) and use rates ranging from one to 20 uses per year. As this table shows, annual cost per use can range from \$1,063 (at one use per year and \$1,000 subscription price) for Model 3, where back files are permanently bound before being relocated to storage, to \$48 per year (at 20 uses per year and \$900 subscription price) for Model 4, where journal issues are simply discarded after a specified retention period.

Table 22. Unit Costs for CMI Cost Models

	Model 1 Electronic Access	Model 2 Retain in Library	Model 3 Store Bound	Model 4 Discard Unbound	Model 5 Store Unbound	Model 6 Direct to Storage
FIXED COSTS						
Construction cost per volume per year						
On campus library facility with regular shelving		\$1.43				
Storage facility with compact shelving			\$0.33		\$0.33	\$0.33
Journal subscription costs per title per year						
Electronic access fee	\$530					
Printed copy of journal		\$952	\$952	\$952	\$952	\$952
Processing costs to move a volume to a storage facility or to discard it						
Select material to be sent to storage			\$2.26	\$2.26	\$2.26	
Process materials for transfer to storage			\$0.71	\$0.71	\$0.71	
Transport materials to storage			\$0.60		\$0.60	
Other fixed costs						
Binding costs per volume		\$12.87	\$12.87		\$3.20	\$3.20
Processing costs per volume at the storage facility			\$2.88		\$2.88	\$2.88
Total fixed costs (excluding electronic access fee/journal subscription cost)	\$0.00	\$56.20	\$58.33	\$2.97	\$20.32	\$16.75
VARIABLE COSTS						
Circulation costs per issue or volume						
Circulation from a local library		\$3.26	\$3.26	\$3.26	\$3.26	
Circulation from a storage facility			\$4.70		\$4.70	\$4.70
Supply a reproduction of the article to the user from a storage facility			\$3.94		\$3.94	\$3.94

5.3. ANALYSIS OF POTENTIAL COST SAVINGS

These cost models were developed to explore strategies for managing the print versions of journals when the digital versions were also available (i.e., Model 1 was always included). The findings displayed in Figure 30 and Table 23 suggested that the least-cost strategy for a single library would be to cancel the print subscriptions and rely exclusively on the digital journals. For a journal with a digital subscription cost of \$700 per year and 20 uses per year, for example, the annual cost per use was about \$35 (Figure 30), while the lowest cost per use for the print equivalent at the same use rate was about \$48 (Table 23, Model 4, \$900 subscription cost). However, there may be compelling reasons for the library to retain the print version. If, for example, the library wished to

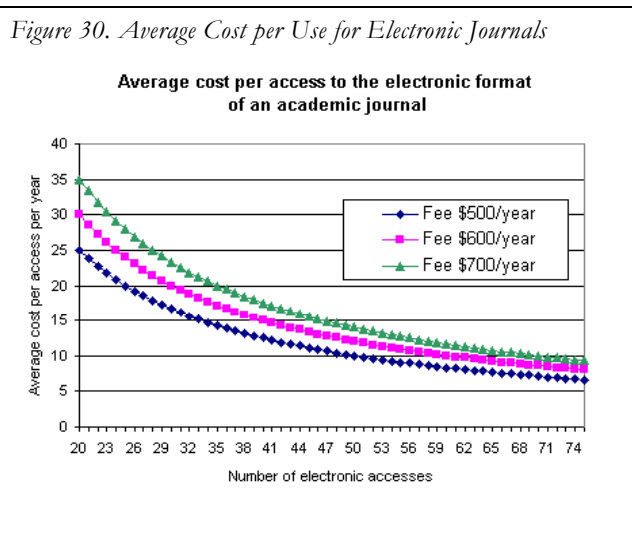


Table 23. Average Cost per Use for Five Print Journal Models

Cost Per Use	Model 2 – Retain in Library	Model 3 – Store Bound	Model 4 – Discard Unbound	Model 5 – Store Unbound	Model 6 – Direct to Storage	Model 2 – Retain in Library	Model 3 – Store Bound	Model 4 – Discard Unbound	Model 5 – Store Unbound	Model 6 – Direct to Storage
Subscription cost/year	\$900					\$1,000				
Number of Uses per Year	Cost per Use									
1	\$959	\$963	\$906	\$925	\$921	\$1,059	\$1,063	\$1,006	\$1,025	\$1,021
2	481	484	455	465	463	531	534	505	515	513
3	322	324	304	311	310	355	357	338	345	344
4	242	244	229	235	234	267	269	254	260	259
5	194	196	184	189	188	214	216	204	209	208
6	163	164	154	158	157	179	181	170	175	174
7	140	142	132	136	136	154	156	147	150	150
8	123	124	116	120	119	135	137	129	132	132
9	110	111	104	107	107	121	122	115	118	118
10	99	101	94	97	96	109	111	104	107	106
11	90	92	85	88	88	99	101	94	97	97
12	83	85	79	81	81	91	93	87	90	89
13	77	78	73	75	75	85	86	80	83	83
14	72	73	68	70	70	79	80	75	78	77
15	67	69	63	66	66	74	75	70	73	72
16	63	65	60	62	62	69	71	66	68	68
17	60	61	56	59	59	65	67	62	65	65
18	56	58	53	56	56	62	63	59	61	61
19	54	55	51	53	53	59	60	56	58	58
20	51	53	48	51	51	56	58	53	56	56

maintain its print subscription to offer current print issues for browsing, but was willing to discard them after the period of peak use (Model 4), it would face an additional cost of \$48 per use (20 uses per year at a \$900 subscription cost), for a total cost of \$83 per use. If the library retained a bound copy of the title in storage as a hedge against the loss of access to the digital versions, or to ensure archival permanence (Model 3), it would incur an additional cost of \$53 per use (20 uses per year at \$900), for a total of \$88 per use for both the print and digital subscriptions.

In this example, there was not much difference between the five print-cost models (Models 2-6), which ranged between \$48 and \$58 per use at 20 uses per year (Table 23). Because the annual subscription cost was the dominant component of cost per use, once the library committed to maintaining the print subscription, there was very little difference among the models in terms of cost per use. For example, while Model 4 (discarding print after a specified period) yielded the lowest cost per use, the additional cost of the most expensive model (Model 3, binding in buckram and relocating to off-campus storage) was only 6-8 percent more expensive than discarding (e.g., at 20 uses per year, the difference between Models 3 and 4 was \$5 per use).

Leverage could be achieved if a group of libraries were to share the cost of one jointly held print subscription, which would allow individual libraries to cancel their print subscriptions and rely on access to the digital version, knowing that a print copy would be available if it was needed. The cost models described above could be combined in a variety of ways to illustrate the potential costs or savings that might accrue to different collaborative print journal management and storage programs. In the examples that follow, the costs of access to electronic formats (Model 1) are not considered, as they are present in all alternatives.

Table 24 compares costs for five alternative consortial storage programs for a library consortium when: the electronic version of a journal is available to all consortium members; five consortium members subscribe to the print versions of the journal; the annual subscription cost for the print journal is \$900; and it is assumed that the print use rate is the same for at all subscribing libraries.

Table 24. Costs for Five Alternative Storage Programs

Uses Per Library	Alternative 1 (Base Case)		Alternative 2			Alternative 3			Alternative 4			Alternative 5		
	Libraries Retain Print Locally (Model 2)		One Library Binds and Stores Off Campus (Model 3); Four Libraries Discard in Lieu of Binding (Model 4)			One Library Stores Unbound Issues Off Campus (Model 5); Four Libraries Discard in Lieu of Binding (Model 4)			One Print Copy Purchased Centrally and Stored Off Campus; All Libraries Cancel Their Subscriptions (Model 6)			One Print Copy Purchased Centrally and Stored Off Campus (Model 6); Five Libraries Discard in Lieu of Binding (Model 4)		
	Total Cost	Cost per Use	Total Cost	Cost per Use	Savings from Base Case	Total Cost	Cost per Use	Savings from Base Case	Total Cost	Cost per Use	Savings from Base Case	Total Cost	Cost per Use	Savings from Base Case
1	\$ 4,797	\$ 959	\$ 4,610	\$ 922	\$ 187	\$ 4,572	\$ 914	\$ 225	\$ 940	\$ 188	\$ 3,857	\$ 5,500	\$1,100	\$ (702)
2	4,814	481	4,628	463	185	4,590	459	223	964	96	3,850	5,539	554	(726)
3	4,830	322	4,646	310	184	4,608	307	222	987	66	3,843	5,579	372	(749)
4	4,846	242	4,664	233	183	4,626	231	221	1,011	51	3,835	5,619	281	(773)
5	4,862	194	4,681	187	181	4,643	186	219	1,034	41	3,828	5,659	226	(796)
6	4,879	163	4,699	157	180	4,661	155	218	1,058	35	3,821	5,699	190	(820)
7	4,895	140	4,717	135	178	4,679	134	216	1,081	31	3,814	5,738	164	(843)
8	4,911	123	4,735	118	177	4,697	117	215	1,105	28	3,807	5,778	144	(867)
9	4,928	110	4,752	106	175	4,714	105	213	1,128	25	3,799	5,818	129	(890)
10	4,944	99	4,770	95	174	4,732	95	212	1,152	23	3,792	5,858	117	(914)
11	4,960	90	4,788	87	172	4,750	86	210	1,175	21	3,785	5,898	107	(937)
12	4,977	83	4,806	80	171	4,768	79	209	1,199	20	3,778	5,937	99	(961)
13	4,993	77	4,823	74	170	4,785	74	208	1,222	19	3,771	5,977	92	(984)
14	5,009	72	4,841	69	168	4,803	69	206	1,246	18	3,763	6,017	86	(1,008)
15	5,025	67	4,859	65	167	4,821	64	205	1,269	17	3,756	6,057	81	(1,031)
16	5,042	63	4,877	61	165	4,839	60	203	1,293	16	3,749	6,097	76	(1,055)
17	5,058	60	4,894	58	164	4,856	57	202	1,316	15	3,742	6,136	72	(1,078)
18	5,074	56	4,912	55	162	4,874	54	200	1,340	15	3,735	6,176	69	(1,102)
19	5,091	54	4,930	52	161	4,892	51	199	1,363	14	3,727	6,216	65	(1,125)
20	5,107	51	4,947	49	160	4,909	49	198	1,387	14	3,720	6,256	63	(1,149)

- **In Alternative 1**, all five subscribing libraries retain and bind their issues of the journal. This was the “base case” against which the cost savings of the other alternatives were measured. In this alternative, the total annual cost to the consortium (the five subscribing libraries) to maintain their subscriptions ranged from \$4,797 at one use per library per year to \$5,107 at 20 uses per library per year, and cost per use ranged from \$959 to \$51.
- **In Alternative 2**, all subscribing libraries maintained their current subscriptions, but four discarded their current issues in lieu of binding, and one bound its issues and placed them in off-campus storage as a safeguard against (temporary or permanent) loss of access to the digital versions. Total annual savings ranged from \$187 (at one use per year) to \$150 (at 20 uses per year) relative to Alternative 1.
- **Alternative 3** was similar to Alternative 2 except that the one library stored the material in unbound form in pamphlet boxes. Savings relative to Alternative 1 ranged from \$225 to \$198 per year. Savings relative to Alternative 2 were \$38 per year.
- **In Alternative 4**, all five libraries canceled their current subscriptions, and one print copy was purchased by the consortium, delivered directly to the off-campus storage facility by the publisher, and stored unbound in pamphlet boxes. Because all libraries avoided subscription,

processing, and storage costs, the savings relative to Alternative 1 were substantial, ranging from \$3,857 to \$3,720 per year.

- **Alternative 5** was similar to Alternative 4, except that the five libraries, in order to meet demand for browsing access to current print copies, continued their subscriptions and discarded issues in lieu of storage. Because this alternative combined many of the costs of Alternative 3 and Alternative 4, it was actually more expensive than the base case (Alternative 1), costing an additional \$702 to \$1,149 per year.

A wide range of alternative consortial collection management alternatives can be evaluated using these six cost models and a variety of assumptions about the size of consortium membership and the extent of print holdings, subscription costs, journal use rates, and combinations of the collection management strategies.

6. CONCLUSIONS

6.1. SUMMARY OF FINDINGS

- When issues of approximately 300 print journals, for which the digital counterparts were readily available, were relocated to storage, there was very little demand for the print versions over a one-year period (these journals were recalled only 201 times, as compared with 6,044 uses of the same journals at campuses that kept the journals on the shelf and monitored their use). The predominant reason for requests to recall print journals from storage related to incomplete content in the digital counterpart, followed by a general preference for the print format. The removal of these journal issues from the shelves generated only 26 reported comments from library users (Section 4.1.1).
- At UC campuses that retained the selected study journals on the shelf and monitored their use, the ratio of uses of the electronic versions of the journals to uses of the print counterparts averaged 16 to 1. Although the measures of use for electronic and print journals are not commensurate (Section 2.2.1), the evidence suggests that electronic journals attract considerably more use than their print counterparts. The ratio of electronic to print use was dramatically higher for journals in physical sciences and engineering (33.5:1), but for other disciplinary areas was remarkably consistent, ranging from 9.6 to 10.4 electronic uses per physical use for journals in the life sciences and arts and humanities, respectively (Table 6). This finding suggests that, while the 22 titles in the arts and humanities and 26 titles in social sciences comprised the minority of study titles, the findings from the Journal Use Study are likely applicable across most academic disciplines.
- Electronic journals are popular, extensively used, and pervasive. Overall, more User Preference Survey respondents had used a digital journal within a week of the survey than had used a print journal. Although this finding does not precisely hold for faculty and graduate students in the arts and humanities (slightly more in this category had used print than digital in the previous week), nearly half of these respondents had used a digital journal in the previous week, and ten percent had done so on the day they responded to the survey (Section 4.1.2; Figure 9 and Figure 10). Overall, 54 percent of survey respondents indicated that all or some of the key journals in their disciplinary specialties are available in electronic form (although this was true for only 21 percent of respondents in the arts and humanities), and 54 percent reported that research in their field is dependent on digital journals (44 percent in the arts and humanities) (Figure 13, Figure 11). Of most importance for the objectives of this study, 82 percent of respondents agreed that electronic journals are a suitable alternative to print (63 percent in the arts and humanities), and 77 percent said that if the print version of a journal they needed were not available, they would use the electronic version in preference to obtaining a print copy from another library (Figure 15, Table 14).
- Undergraduate students are not intensive users of electronic journals. They are substantially less likely to have made recent use of electronic journals than other groups, save staff (Figure 9); while they are similarly unlikely to have made recent use of print journals, their responses are similar to other groups in this regard (Figure 10). Undergraduates are less likely to claim that their research depends on electronic journals (Figure 11) or to trust the reliability of digital journals (Figure 14) and display a somewhat weaker preference for their advantages (Figure 18).

While the lack of availability of electronic backfiles is less likely to be perceived as a barrier for this group (Figure 22), they are more likely to be concerned about printing charges (Figure 25) and the quality of the library's computer equipment (Figure 28).

- Notwithstanding the popularity of electronic journals, it is evident that the print format remains critical to support of scholarship and teaching. Over 20 percent of survey respondents had used a print journal within the previous week (over 30 percent for faculty and graduate students, and nearly 50 percent for respondents in the arts and humanities), and 57 percent indicated that their research remains dependent on print journals (79 percent in arts and humanities) (Figure 10, Figure 12). The strong correlation between recency of use of print and digital formats (Table 13) suggests that frequent journal users seek out the information they need in whatever format it is most conveniently and satisfactorily available.
- A majority of faculty, graduate students, and research staff prefer electronic journals to their print counterparts for a variety of common tasks, such as searching for articles, accessing specific facts, and making copies for personal use, although arts and humanities respondents were somewhat less likely to prefer the electronic format for these purposes (Table 15, Figure 16, Figure 17). In addition, an overwhelming majority of respondents value the fact that electronic journals are available around the clock and can be accessed without traveling to the library, and substantial majorities appreciate the availability through digital journals of downloadable data, links to other content, availability prior to print publication, and avoidance of photocopying costs (Figure 19).
- Notwithstanding the popularity and perceived value of electronic journals, survey respondents identified some problems. The most important of these is the unavailability of older issues in electronic form, a problem cited by 76 percent of respondents, and 92 percent of faculty, graduate students, and research staff (Table 18, Figure 22). Unavailability of recent issues in electronic form is also cited as a problem by 56 percent of respondents and by over 70 percent of those in the arts and humanities and social sciences (Figure 23), although the reasons for this perception are not clear. Only a minority cited the omission of certain kinds of content (letters, advertisements, etc.) as a barrier (31 percent overall, 24 percent of faculty and graduate students); however, 61 percent of those who completed a Return Request Survey in the Journal Use Study indicated that they had requested recall of the print issue of a journal from storage at an experimental location because the online version was incomplete (Table 8), suggesting that such omissions can be important for some library users.
- Usability characteristics of electronic journals represent at least a minor barrier to a significant number of survey respondents, ranging from 45 to 59 percent (Table 19, Figure 24). The leading problems include reading on the computer screen (59 percent of all respondents, 70 percent of faculty and graduate students) and highlighting or making notes in electronic journal articles (59 percent of all respondents and of faculty and graduate students). Printing issues, including printing charges and reproducing color illustrations, were particular barriers for undergraduate students and health care professionals (Figure 25, Figure 26).
- The most important technology-related barrier to the use of electronic journals was gaining access to the library's online journals from off-campus locations, identified by 59 percent of respondents (Table 20). Other barriers related to home, office, or library computer equipment, the speed of home Internet connections, and computer skills and training, were less frequently

mentioned (27-48 percent of respondents), but those numbers are large enough that these technology barriers should not be ignored.

- An analysis of the costs incurred by libraries in providing both print and digital journals shows that, on average, electronic journals cost less on a cost-per-use basis than their print equivalents (Section 5), even when the library applies a variety of collection management strategies (remote storage of bound or unbound backfiles; discarding of backfile issues in lieu of binding) to reducing the life-cycle cost of the print journal collection. Given the findings from this study regarding the use and popularity of digital journals, it appears that libraries that subscribe to both the print and digital versions of a journal can achieve considerable savings by canceling their print subscriptions and relying on the digital.
- However, our findings also suggest that print journals remain important to library users and that the content, usability, and technological characteristics of the current generation of digital journals present barriers to their effective use for significant minorities of users. It may therefore be prudent for a library to ensure that it has ongoing access to the print versions of journals that it offers in digital form. For a single library, the cost of retaining access to both print and digital formats can be substantial, even under the most austere regimes for managing print, because the cost of subscribing to both formats is the largest component of total cost. If a group of libraries were to share the cost of one jointly held print subscription housed in low-cost off-site storage while maintaining individual electronic subscriptions, savings can be achieved that are on the order of 75 percent of the total cost of maintaining dual-format subscriptions by all members of the group. Because data from the Journal Use Study indicate that the stored print copies will be rarely recalled for use, this model of collection management would appear to have minimal impact on the quality of library service.

6.2. IMPLICATIONS FOR PLANNING AND ACTION

As described in Section 1.2, the UC libraries have an extensive history of offering access to electronic journals to their users, as well as providing rich linking mechanisms in their catalogs and other bibliographic systems that assist users to find and retrieve electronic journal articles. As a result, UC's library users may have gained greater familiarity with electronic journals than is the case in other institutions, a fact that may have influenced the findings of the CMI studies. However, perhaps by virtue of the UC Libraries' broad experience with digital journals, the findings from the Journal Use Study and the User Preference Survey were not unexpected. As one librarian observed after reviewing the preliminary findings, "the report presents evidence that corroborates librarian anecdotal information regarding patron use of journals in print and electronic formats." Overall, the research findings revealed no contradictions with the University's stated mission to continue to build digital collections, nor did the research provide any evidence that users would be unwilling to rely primarily on digital journals, provided that a safety net in the form of a print archive were maintained by the University. An assessment of the research results underscores the judgment that strategies must be developed that blend and effectively manage print and digital collections in a cost-effective manner while preserving content and meeting the institutional goal of providing access to emerging digital resources.

The following UC initiatives, some ongoing and some emerging, are supported by the research findings of the CMI project:

6.2.1. Digital Journal Collections

The results of the User Preference Survey show that from the user's perspective, continuing to add digital journal collections is highly desirable. Fifty-four percent of respondents agreed or strongly agreed with the statement "Research in my field is dependent on the library's electronic journals." A majority of respondents reported that all or most of the key journals in their fields were available in digital form (see Section 4.1.2). Most notable in relation to collection development was the finding that 76 percent of the respondents stated that, "Unavailability of older issues of journals in electronic form" was a major or minor barrier to access.

6.2.2. Shared Print Journal Collections

As the Journal Use Study was drawing to a close in the fall of 2002, the importance of shared Universitywide library collection development addressing all formats, not just digital resources, was viewed as an essential strategy to enhance UC library collections and services needed to support the University's teaching and resource programs. While data from the User Preference Survey showed that digital journal are generally popular and frequently used, findings also revealed that print journals remained an important resource to many scholars, especially those in arts and humanities (see Section 4.1.2).

When the CMI project was launched, campus libraries held subscriptions to nearly 6,000 print journals that were also available on all campuses in digital form. UC libraries were burdened with increasingly complex and expensive acquisition, processing, cataloging, and management activities in order to make available these largely duplicative and growing collections. It was becoming increasingly necessary to develop cost-effective strategies to address this redundancy.

In its October 2002 report to SLASIAC, the Scholarly Information Program Task Force observed that UC's shared digital collection has been remarkably effective. The task force recommended that the shared collection concept be expanded beyond the digital realm to include print collections on a selective basis. At the same time, the UC Collection Development Committee recommended that UC launch a pilot program to build a shared print journal collection with Elsevier and ACM journals. Anticipating the need to preserve at least one print copy of journals available in electronic form, the CDL had already begun to negotiate license agreements with major vendors that guaranteed a print archival copy of the electronic journals. The pilot to establish a shared print collection of print journals was initiated in January 2003.

Subsequently, the University Librarians drafted a definition of the University of California Shared Collection, which will be used to guide library planning and development:

The University of California Libraries' Shared Collection consists of information resources jointly purchased or electively contributed by the libraries. Such resources are collectively governed and managed by the University Librarians for the purpose of maximizing access to the widest audience of current and future members of the UC community.

The shared collection is one in a portfolio of strategies for enhanced and expanded resource sharing and collection coordination employed by the UC Libraries to provide

faculty, students and staff with access to a collection of breadth and depth appropriate to a world-class research, teaching, and public service institution

Recognizing the need to provide oversight for the development of shared print collections, the University began to recruit a director of shared print collections. The incumbent will lead systemwide planning efforts to develop and implement shared print collections with key constituencies, and identify and collaboratively resolve policy issues relating to the identification of potential collections.

6.2.3. Shared Services

At a planning retreat in late 2002, the University Librarians acknowledged that a strategy for shared collection management must be accompanied and supported by a service plan.

For some time, there had been ongoing efforts to expand the University's resource sharing infrastructure. Fortunately, new technologies are enhancing the sharing of print resources from the traditional interlibrary loan model to include patron-initiated requesting via the University's union catalog, an overnight courier service, and the initiation of desktop delivery. Several campuses are currently fulfilling requests for journal articles by sending a digital image to a Web site where the user can access it. All campuses will be fully capable for desktop delivery by 2004.

In addition to planning for a shared print journal collection, the University's Collection Management Planning Group (CMPG) identified a shared government publications collection as a priority due to the importance of the collections and the existing strength of collaboration among the campuses. The CMPG stated that the work with government publications could be a model for subsequent initiatives for archiving print and digital collections. Subsequently, a task group was charged with developing a framework and implementation plan for a unified Government Publications Repository. In addition, the task group addressed public service issues by recommending that reference staff be trained to make appropriate referrals and that communication and cooperation between government information librarians be expanded and complex government information questions be shared via a Universitywide server or digital reference program.

6.2.4. Changing Role of the University's Regional Library Facilities

In her forward to CLIR's monograph, "Developing Print Repositories: Models for Shared Preservation and Access," Abby Smith described the University of California RLFs as an example of "repositories that go beyond the mere sharing of storage space to the sharing of management and access—in some cases decoupling ownership from governance—[and] are those that build on previous histories of collaboration and interdependence" (Reilly, 2003). The University's two regional storage facilities are assuming a more active role as centers for storing and preserving shared content. As evidence of this changing role, a UC task group was established in 2003 to develop and propose an action plan for the future of the Regional Library Facilities. One of the issues the task group will address is future role for the Regional Library Facilities in supporting shared collection management strategies. CMI research findings show wide acceptance of digital journals and validate the elimination, or at least reduction in redundancy, of print journal subscriptions held by campus libraries while preserving a last print copy.

6.2.5. Cost Models

One outcome of the CMI was a series of cost models developed by consultant Michael Cooper and the UC Systemwide Library Planning office (see Section 5). These models will assist University planners in choosing from a number of alternatives for the management of print and digital journal collections. The cost models developed for the project can be combined in a variety of ways to illustrate the potential costs or savings that might accrue to different collaborative print journal management and storage programs.

6.2.6. Digital Archiving

The User Preference Survey revealed that a substantial number of users were concerned with temporary disruptions and long-term uncertainties about the archival durability of electronic journals. Forty-six percent of the respondents agreed with the statement, “Even if both are available, I think print journals are more reliable than electronic journals” (see Section 4.1.2 above). In other words, nearly half the respondents had some reservations about the stability of electronic journals. The CDL is currently investigating methods to preserve and manage licensed digital content. To this end, the CDL is participating in a beta test of experimental caching software that captures and locally manages licensed electronic journals and other content. Negotiations are ongoing with selected publishers to capture and preserve content to which the University has perpetual rights.

6.3. AREAS FOR FURTHER STUDY

The scope of the Collection Management Initiative was relatively circumscribed by its focus on the substitutability of digital journal formats for print when both are available, and the resulting implications for management of a library’s journal collection. These issues reside within a larger context: the production, distribution, acquisition, storage and use of the journal literature, in a variety of formats, in the academic setting. The Journal Use Study and User Preference Survey uncovered a number of areas that were outside the scope of the CMI project, but that may warrant further investigation within that wider context. Some examples follow:

- Use studies specifically targeting social science and humanities journals. In the CMI Journal Use Study, and for most responses in the User Preference Survey, there were not statistically strong differences among disciplinary groups. However, for those survey responses that did display strong differences, there was a fairly consistent pattern: humanities respondents were least favorably disposed toward electronic journals, followed by the social sciences, while respondents from the physical and biological/health sciences strongly favored the electronic format. There are undoubtedly a number of possible explanations for this finding, only some of which are illuminated by CMI data: fewer titles available in electronic format for the humanities and social sciences (see Figure 13), unavailability of the most recent issues of journals online (see Figure 23); and problems with office and library computer equipment and computer skills and training (see Figure 29). It would be helpful to have a better understanding of the reasons for these differences and their implications for management of library journal collections.
- Further research into the preference for digital versus print journals by undergraduates, and into how undergraduates gather information. Somewhat counterintuitively, the CMI findings suggest that undergraduates are not heavy users of electronic journals. Do they rely on reserve materials,

such as readers, or do they “google” the Internet rather than the licensed periodical literature available on library Web sites?

- Research into the preferences of users for online catalogs or journal lists on library Web sites as discovery tools. In terms of ease of use, which do users prefer?
- Further studies to determine what the methods used to count the use of a print journal article or a digital journal article actually measure. Little is known about how digital journals are used, even when, according to vendor data, a user has accessed the full text of an article. How reliable are reported vendor use data? Is a single access to the full text of an article actually a use? How reliable are print usage counts based on reshelving volumes and unbound issues?
- Further analysis of the Journal Use Study data. As noted in Section 4.1.1 above, preliminary statistical tests of the voluminous data from the Journal Use Study proved inconclusive, although the results hinted at some potentially interesting relationships. In addition, some title-level data on journal characteristics, described in Appendix P, were not systematically analyzed. This data source could be mined more thoroughly.

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Appendix A. GLOSSARY

CDL: California Digital Library

CDC: University of California's Collection Development Committee, responsible for advising on collection development issues.

CMI: Collection Management Initiative

CMI Liaisons: See Appendix C, Advisory Structure

CMPG: Collection Management Planning Group, a group of faculty and University Librarians appointed by SLASIAC who focus on collection management, storage, and the University's archival responsibilities.

Comment cards: Forms available at public service desks, at the shelf location, and at the CMI Web site during the Journal Use Study to give library users the opportunity to comment on the Study.

Control: A term applied to journals that remained on campus library shelves during the Journal Use Study or to libraries (sites) that chose to designate selected journals as such.

Counter: An international initiative designed to serve librarians, publishers, and intermediaries by facilitating the recording and exchange of online usage statistics. In December 2002, COUNTER released a [Code of Practice](#) that provided guidance on data to be measured, definitions of these data elements, usage report content and formats, and data processing. Many of the providers whose journals were included in the Journal Use Study agreed to abide by these guidelines.

Digital journal: A journal available online in digital form, also called an ejournal

Ejournal: See **Digital journal**

Experimental: A term applied to journals that were relocated to remote storage during the Journal Use Study, or to libraries (sites) that chose to designate selected journals as such. The following example illustrates the difference between experimental and control journals:

- At the control library, print issues and volumes of the *Henry James Review* remained on library shelves and use data was gathered.
- At the experimental library, print issues and volumes of the *Henry James Review* were relocated to remote storage and use data was gathered.
- Usage data was gathered for the digital version of the *Henry James Review* at the experimental campus.
- Usage data was gathered for the digital version of the *Henry James Review* at the control campus.

Formative interviews: Used to refine the final User Preference Survey questions, determine whether they were meaningful and answerable, and determine whether the response categories were relevant to the purposes of the study (see Section 3.1.1).

ISSN: International Standard Serial Number, an eight-digit number that identifies periodical publications, including electronic serials.

JSTOR: An independent third-party provider of digital journals for which only back runs are available.

LPAI: Library Planning and Action Initiative, a UC task group that proposed specific recommendations for improving the organizational, functional, and budgetary context within which the UC libraries operate (see Section 1.2).

Moving Wall: Term used by JSTOR to represent the time period between the last issue available and the most recently published issue of a journal. It is specified by publishers in their license agreements with JSTOR, and generally ranges from 3 and 5 years. In calculating the moving wall, the current, incomplete year is not counted.

Operations Advisory Committee: See Appendix C, Advisory Structure.

Provider: Publisher or aggregator with which the University has a license agreement to provide access to a group of electronic journals. Providers were also the source of digital usage data for the journals in the Journal Use Study.

RLF: See Regional Library Facility.

Regional Library Facility: The University of California has two regional library facilities (one in the north and one in the south) where seldom-used campus library materials are stored. During the Journal Use Study several campuses stored experimental journal volumes and unbound issues in the Regional Library Facilities.

Research Advisory Committee: See Appendix C, Advisory Structure.

Return Request Survey: A survey given to users who requested that a print copy of a journal be returned from storage for use during the Journal Use Study. See Sections 2 and 3.

SLASIAC: Systemwide Library and Scholarly Information Committee, a UC committee established in 1998 as an outgrowth of the Library Planning Advisory Initiative to advise the University on systemwide library policies and strategic priorities, long term planning for the nine campus libraries and the CDL, and on strategies to enhance and facilitate the transmission of scholarly and scientific communication in a digital environment (see Section 1.2).

Study title: A serial publication selected for the Journal Use Study, for which the University has at least two subscriptions to the print version located at two or more campuses. The University holds a license agreement with the provider to provide access to the digital counterpart systemwide.

Union catalog: The University of California's online catalog, Melvyl, which contains the catalog records of more than 20 libraries on nine campuses.

Use/Usage: As applied to experimental print journals selected for the Journal Use Study, each request for a study title, volume, unbound issue, or article copy from a storage location. As applied to control print journals selected for the Journal Use Study, refers to each instance of reshelving a volume or unbound issue at the control library during the Study period. As applied to digital journals selected for the Journal Use Study, each access to the full article text as reported by the provider (see Section 2.2.1 for an explanation of the methodology for counting use).

Appendix B. RESOURCES

PRESENTATIONS AND PUBLICATIONS BY PROJECT STAFF

Brian Schottlaender, Principal Investigator

Presentation: "The University of California Collections Management Initiative and the Emerging UC Libraries Shared Collection Concept." Triangle Research Libraries Network Collections Symposium; Durham, North Carolina, December 2003.

Presentation: "Selected Finding from the UC/CMI Journal Use and User Preference Studies." Reaping the Harvest: Studies of Electronic Journal Use, Ohio State University, Columbus, Ohio, October 2003 (<http://www.ucop.edu/cmi/pubs_osu.html>).

Presentation: "Update on Collection Management Initiative," ALA Directors of Technical Services Discussion Group, June 20, 2003.

Presentation: "University of California Collection Management Initiative: A Study of Behavior and Attitudes of People Using Electronic Journals," 142nd Annual Meeting, Association of Research Libraries, Lexington, Kentucky, May, 2003 (<http://www.ucop.edu/cmi/pubs_arl.html>).

Presentation: "Update on Collection Management Initiative," ALA Chief Collection Development Officers of Large Research Libraries, January 24, 2003.

Presentation: "Update on Collection Management Initiative," ALA Directors of Technical Services Discussion Group, January 2003.

Presentation: "University of California's Collection Management Initiative: Update with Six Months Data," Association for Library Collections and Technical Services, Chief Collection Development Officers of Large Research Libraries Discussion Group, American Library Association Annual Conference, Atlanta, June 15, 2002.

Presentation: "University of California's Collection Management Initiative: Update with Six Months Data," Association for Library Collections and Technical Services, Technical Services Directors of Large Research Libraries Discussion Group, American Library Association Annual Conference, Atlanta, June 14, 2002.

Presentation: "University of California's Collection Management Initiative," Association for Library Collections and Technical Services, Chief Collection Development Officers of Large Research Libraries Discussion Group, American Library Association Midwinter Conference, New Orleans, January 19, 2002.

Gary Lawrence, Co-Principal Investigator

Presentation: "The University of California Collection Management Initiative," Digital Library Federation Spring Forum 2003, New York, New York, May 15, 2003 (<http://www.ucop.edu/cmi/pubs_dlf.html>).

Cecily Johns, Project Director

Presentation: "Collection Management Initiative at the University of California," ALA CMDS Collection Development Librarians of Academic Libraries Discussion Group, June 21, 2003.

Presentation: "Collection Management Initiative at the University of California," ALA LAMA Storage Discussion Group, January 26, 2003.

"Collection Management Strategies in a Digital Environment," The Serials Librarian, 43 (3), 2003, pp. 83-88.

Presentation: "Collection Management Strategies in a Digital Environment," Special Libraries Association, Los Angeles, June 10, 2002 (<<http://www.ucop.edu/cmi/docs/cecilysla.ppt>>).

Presentation: "Collection Management Strategies in a Digital Environment," California Academic and Research Libraries Pre-Conference: Collection Analysis in an E-World, Asilomar, May 9, 2002 (<<http://www.ucop.edu/cmi/docs/cecilycarl.ppt>>).

"Collection Management Initiative," University of California, Santa Barbara Library Newsletter, Fall 2001, p. 5 (<<http://www.library.ucsb.edu/journals/faculty/fall2001.pdf>>).

Presentation: "Collection Management Strategies in a Digital Environment," Digital Library Federation Spring Forum, San Francisco, May 6, 2001.

"Collection Management Strategies in a Digital Environment," Issues in Science and Technology Librarianship, Spring 2001 (<<http://www.library.ucsb.edu/istl/01-spring/article6.html>>).

Presentation: "Archiving Print in a Digital Environment: Usage vs. Preservation," American Library Association Midwinter Conference, ALCTS Serials Section, Research Libraries Discussion Group, Washington D.C., January 13, 2001.

Presentation: "Collection Management Initiative," made to UC campus libraries (<<http://www.ucop.edu/cmi/docs/cmi.ppt>>).

Presentation: "Collection Management Strategies in a Digital Environment," The New Dynamics & Economics of Cooperative Collection Development Conference Hosted by Center for Research Libraries, Atlanta, GA, November 9, 2002 (<<http://www.crl.edu/awcc2002/UC%20Paper%20-%20Johns.pdf>>). (Also available: PowerPoint Presentation: <<http://www.ucop.edu/cmi/docs/crl-cmi.ppt>>)

Karen Andrews and Christy Hightower, Members, Operations Advisory Committee

Presentation: "Are Engineers Ready to Live Without Print Journals? A Report on the University of California CMI Experiment." Collection Issues Forum, 2002 Conference of the American Society for Engineering Education, Montreal, Quebec, Canada; June 18, 2002.

RELATED PUBLICATIONS

Bertreaux, Susan S. and Peter Brueggeman, "Electronic Journal Timeliness: Comparison with Print." *Serials Librarian*, 41 (2) 2001, 101–118.

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Appendix C. ADVISORY COMMITTEE ROSTER

In consultation with the University Librarians, the CMI project team identified four major advisory groups to assist in the planning and implementation of the various CMI research projects. While the following CMI advisory groups played major roles in support of grant objectives, CMI staff also utilized the existing advisory structure of the University of California libraries for advice and support. In addition to the University Librarians, project staff also consulted with other advisory committees: in particular, the Systemwide Library and Scholarly Information Advisory Committee (SLASIAC), a universitywide committee of faculty and academic administrators established to advise the University of library policies and strategic priorities; the Systemwide Operations and Planning Advisory Group (SOPAG), responsible for developing action plans for consideration by the University Librarians; and the Collection Development Committee (CDC) responsible for coordinating systemwide activities relating to collection development.

CMI Steering Committee

The CMI Steering Committee was formed to provide general oversight for the design and implementation of the project and to advise on the preparation and interpretation of project results. During the grant the Committee met with project staff three times to review all aspects of the research projects, including the design, planning, and implementation of the Journal Use Study and of the User Preference Survey.

Members:

University Librarian Brian E. C. Schottlaender, UC San Diego (chair)

University Librarian Sarah Pritchard, UC Santa Barbara

Prof. Charles Altieri, Dept. of English, UC Berkeley

Prof. Theodore C. Bergstrom, Dept. of Economics, UC Santa Barbara

Prof. Ling-Lie Chau, Dept. of Physics, UC Davis

Prof. Christopher Cullander, Dept. of Pharmacy, UC San Francisco

CMI Research Advisory Committee

The Research Advisory Committee (RAC) was established to advise the project team on matters related to the development of the research project, including general methodology, timelines, interview and survey instruments, and data analysis for the CMI. The Committee met three times during the grant period to consider a draft of the Research Plan, analyze the data gathered during the Journal Use Study, and advise staff on the content, language, and timing of the User Preference Survey. Unlike other advisory groups, the RAC included some members from institutions outside the University of California.

Members

Dr. Gary S. Lawrence, UC Systemwide Library Planning (chair)

Professor Lisa A. Bero, UC San Francisco

Professor Christine Borgman, UC Los Angeles

Professor Michael Cooper, UC Berkeley

Associate Professor Ann P. Bishop, University of Illinois

Executive Associate Dean of Libraries Colleen Cook, Texas A & M University

Associate Professor Anne J. Gilliland-Swetland, UC Los Angeles

Associate University Librarian Susan S. Starr, UC San Diego

CMI Campus Liaisons

Early in the planning phase the project team determined that the CMI would benefit by having a librarian from each campus coordinate the planning for and implementation of the Journal Use Study. University Librarians were asked to identify a senior manager to serve as the initial point of contact for project-related matters, both for the project team and for involved campus staff and to ensure effective coordination and communication for project-related activities on their campuses.

Campus Liaisons were responsible for overseeing the Journal Use Study on their campuses. The Liaisons also played a pivotal role in the process of transferring grant funds to the libraries from the Office of the President to support their participation in the project and in securing campus Human Subjects approval for project interviews and surveys.

Campus Liaisons

Christy Hightower, UC Santa Cruz

Cecily Johns, UC Santa Barbara

Mary Ann Mahoney, UC Berkeley

Phyllis Mirsky, UC San Diego

Michael Randall, UC Los Angeles

David Rios, UC Riverside

Lorelei Tanji, UC Irvine

Jacqueline Wilson, UC San Francisco

Gail Yokote, UC Davis

CMI Operations Advisory Committee

The Operations Advisory Committee was formed to advise CMI staff on issues related to the consultation, planning, preparation, and implementation phase of the project, in particular the Journal Use Study. Members of the Committee volunteered to serve on six subgroups to advise on specific aspects of the Study.

- The Consultation subgroup devised a survey to gather information from Campus Liaisons about the consultation and decision-making process that occurred during the planning phase of the Journal Use Study.
- The Publicity subgroup recommended specific tools to be created for use by librarians to publicize the CMI project on their campuses.

- The Bibliographic Control subgroup made recommendations on the methodology and specifications for record changes in both the union catalog (Melvyl) and in local campus catalogs during the Journal Use Study.
- The Costs subgroup devised a cost model for the project to estimate the cost to campuses and storage facilities and developed a cost taxonomy to be used to gather cost information from the campuses.
- The Usage Data subgroup surveyed the campuses to determine how usage data was gathered and recommended methodology for counting use of print journals.
- The Interlibrary Loan and Document Delivery subgroup considered different options for gathering use data for stored print journals and recommended methods for counting their use.

The work of these groups contributed immeasurably to the success of the Journal Use Study. Later the Committee was also asked to advise staff during the development of the User Preference Survey.

Members

Karen Andrews, UC Davis

Colleen Carlton, SRLF

Eric Forte, UC Santa Barbara

Christy Hightower, UC Santa Cruz

Cecily Johns, UC Santa Barbara (chair)

Kathryn Kjaer, UC Irvine

Rosalie Lack, CDL

Lee Leighton, UC Berkeley

Roberta Medford, UC Los Angeles

Scott Miller, NRLF

Jacqueline Wilson, UC San Francisco

Stefanie Wittenbach, UC Riverside

Appendix D. RETURN REQUEST SURVEY INSTRUMENT

See <<http://www.ucop.edu/cmi/finalreport/appendices/appd.pdf>>.

Appendix E. RETURN REQUEST SURVEY RESULTS

See <<http://www.ucop.edu/cmi/finalreport/appendices/appe.pdf>>.

Appendix F. FINAL LIST OF SELECTED CMI JOURNALS

See <<http://www.ucop.edu/cmi/finalreport/appendices/appf.pdf>>.

Appendix G. EXAMPLES OF PUBLICITY TOOLS

Publicity materials developed for campus use for the CMI Journal Use Study are available at
<<http://www.ucop.edu/cmi/publicity.html>>

Appendix H. CONSULTATION SURVEY INSTRUMENT

See <<http://www.ucop.edu/cmi/finalreport/appendices/apph.pdf>>

Appendix I. CONTROL USE DATA SLIP

See <<http://www.ucop.edu/cmi/finalreport/appendices/appi.pdf>>.

Appendix J. FORMATIVE INTERVIEW SCRIPT

See <<http://www.ucop.edu/cmi/finalreport/appendices/appj.pdf>>.

Appendix K. FORMATIVE INTERVIEW REPORT

See <<http://www.ucop.edu/cmi/finalreport/appendices/appk.pdf>>.

Appendix L. USER PREFERENCE SURVEY

See <<http://www.ucop.edu/cmi/finalreport/appendices/appl.pdf>>

Appendix M. COMMENT CARD

See <<http://www.ucop.edu/cmi/finalreport/appendices/appm.pdf>>.

Appendix N. WEB COMMENT FORM

See <<http://www.ucop.edu/cmi/finalreport/appendices/appn.pdf>>.

Appendix O. COMMENTS RECEIVED

See <<http://www.ucop.edu/cmi/finalreport/appendices/appo.pdf>>.

Appendix P. TITLE CHARACTERISTICS

See <<http://www.ucop.edu/cmi/finalreport/appendices/appp.pdf>>.

Appendix Q. USER PREFERENCE SURVEY RESULTS

See <<http://www.ucop.edu/cmi/finalreport/appendices/appq.pdf>>.

**Appendix R. THE COSTS OF PROVIDING ELECTRONIC JOURNAL ACCESS
AND PRINTED COPIES OF JOURNALS TO UNIVERSITY USERS**

See <<http://www.ucop.edu/cmi/finalreport/appendices/appr.pdf>>