A Very Warm Welcome from TRIM

Welcome to the maiden issue of Trends in Information Management (TRIM)– an annual journal of the Department. It is a matter of satisfaction for us that the Department is making strides in different directions; it has remodeled the traditional truncated BLIS and MLIS programmes into a two years integrated Master's programme; it has fine-tuned its course contents to blend them with modules essential for training students in new professional competencies that the profession claims in the wake of deep penetration of ICT into the whole gamut ot the profession; it has established a ICT Laboratory with essential ICT gadgets to train young men and women to manage and operate library and information services in keeping with the requirements of the Information society of the day; and, now launching of a journal, an annual, to begin with.

The publication of the Journal TRIM is a testament to the profound effects of the ongoing revolutionary changes in library profession round the globe. Information Management provides an innovative, transdisciplinary approach to the management of information — the most critical asset of our time. Our central mission with the publication of the journal is to provide a platform for professionals studying the impact and consequences of ICT on information gathering, organizing, accessing and harvesting activities, in order to analyze, deliberate and debate on these changes that are now studied under the umbrella term of Information Management. It is intended to provide an interdisciplinary forum to address the issues, problems and policies that matter most today with an eye on the issues that may matter tomorrow in all facets of Information Management. This phrase is a recent development reflective of emerging trends in managing information sources and services in digital and networked environment. The field though expanding rapidly is still at a teething stage.

The articles in this inaugural issue of TRIM focus on important areas of interest to professionals and students. They are a collection of important research papers invited from professionals working in an advanced environment of information management. The paper *Who Uses What* is a very informative article based on a national survey studying the use of electronic and print media by academics. The findings are succinct and the authors conclude that use of electronic resources is on the rise but the traditional print format "is not dead" At the end they pose questions very vital from information management point of view—*Who will ensure their continuing preservation, and how?* Second paper is equally significant. Libraries world over are now engaged in subscribing to both print and electronic journals and the comparison of non-subscription costs of these formats in eleven US academic libraries would be useful for professionals in libraries in more than one way. The authors' findings favour the transition to the electronic format subscription as an economy measure though they have spotted a very pertinent question of archiving solutions to ensure long-term preservation and access to materials in the new format. The third paper is equally interesting and relates to the establishment and operation of map collections in the ICT environment. It offers comprehensive details about the Alexandria Digital Library project that offers web-based service to users the world over. An article by the Chief Editor sums up the problems that have surfaced in the Information Society and how the libraries can tackle them effectively.

A paper on bibliometric analysis of theses submitted to the university of Kashmir in the field of Sciences for a span of 20 years demonstrates the application of bibliometric laws to the field. In order to encourage young scholars we have accommodated an article on new competencies that the professionals are called upon to acquire to deliver goods in the emerging environment. In order to diffuse information on developments of professional interest a separate section under the

caption NEWSCAN has been incorporated in the journal. This must be of particular interest to the professionals as it will help us to know the trends and developments across the globe. Review of books should be a permanent feature of a journal so that special features of some publications of professional interest are identified by those who have found something of special interest in them. Three book reviews adorn the pages of this issue.

I place on record the support of the University of Kashmir by way of giving a green signal for the publication of the journal, funding for its publication and in a host of other ways. We look forward to similar favours in future as well. I am particularly thankful to worthy Vice-Chancellor for writing a thoughtful message for the journal.

Then, I feel it my duty to thank the distinguished authors whose papers adorn the pages of this journal. I look forward to their contributions in future as well.

I would like to express my profound thanks to the teaching faculty of the Department, Dr. S M Shafi in particular. He was very eager to see the journal in its finished form and did a lot of editorial work.

I hope and pray the journal continues as a regular feature of the academic activities of the Department and, in due course of time, turns to be a biannual and even quarterly.

Prof. Wajih A Alvi

Who Uses What?

Report on a National Survey of Information Users in Colleges and Universities

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Introduction

Time was when ambitious scholars began their research by consulting the paper card catalogs and finding aids of their campus libraries, corresponding by mail with professors, librarians, and archivists elsewhere about available resources, and checking the bibliographies of already published, printed works. Then they holed up in carrels in library stacks to study printed works available there and from others by interlibrary loan, hoping all the time for financial aid to travel to other repositories that contained needed books, journals, and paper documents. In the meantime, yesteryear's professors also put printed course materials physically on reserve in campus libraries for their students, who laboriously scribbled notes to take back to their dorms, where they penned or typed their course papers (making corrections with White-Out), and stayed up late reading expensive, bulky textbooks to prepare for exams.

The advent of Web-accessible, digital information has made all that seem, if not yet obsolete, at least quaintly inefficient. Today's professor may sit in the comfort of a home or office to do research, employing a computer to search electronic card catalogs, e-journals, and huge databases of digitized scholarly information. Also said professor may prepare "distance-education" courses and PowerPoint presentations, post class assignments and reading materials electronically through "courseware," and send e-mail answers to questions from students, who use computers both to find information and to write their "papers." At least this is the expectation of colleges and universities that are investing heavily in computer infrastructure and digital resources for research, teaching, and study.But to what degree is the supposed transformation really happening? How extensively are professors and students using the new digital resources? How comfortable are they with electronic information technology? How radically is it changing how they teach, study, and undertake research? And what are the implications of these changes for higher-education administration?

A National Survey

Answers are available from a major information-use survey of 3,234 faculty members, graduate students, and undergraduates in 392 doctoral research universities, public and private, and private liberal arts colleges. The list, though not representative of all higher-education institutions, is national in coverage. The Digital Library Federation (DLF) and the Council on Library and Information Resources (CLIR) commissioned the study from Outsell, Inc., a research firm, which gathered data through interviews (approximating a half-hour each) conducted between November 14, 2001, and February 2, 2002.

The resulting data appear in 659 tables that include break-outs by academic roles, types of institution, and fields of study. The DLF and CLIR (which provides the DLF's administrative home) have published 158 summary tables, along with an introduction by Amy Friedlander of CLIR's staff, in an 893-page report entitled *Dimensions and Use of the Scholarly Information Environment*. It is available in print and also electronically through CLIR's Web site: <http://www.clir.org/pubs/abstract/pub110abst.html>, where all 659 tables also are available.

Three caveats apply to any analysis of these data. First, the statistics characterize what respondents *said* they do when searching for and using information; the study did not include observations of actual behavior. Second, the statistics summarize responses at a point in time rather than over time, providing little trend data; only a few questions elicited information about experienced or anticipated changes. Third, low response rates for some questions render the results only suggestive. Nonetheless, analysts are making detailed studies of this rich data

collection. Library directors, various vendors, publishers and others are scrutinizing the data for insight of value in decision making—about library space planning, to take a known, early example. And the data make possible studies of the information source preferences and use behaviors of particular segments of the academic community: for example, graduate students in the social sciences in large private universities.

What do the data say about academic information use in general? This article will deal with four related aspects of that question. How fully is the academic community accepting and using electronic technologies and their fruits? Are printed materials giving way to electronic information in the work of scholars, teachers, students? What does the survey indicate about the status of and outlook for the campus library? And what do the findings suggest about higher education's information needs?

Comfort with Digital Resources

In answer to the first question, the use by faculty and students of digital information and their comfort with it seem to be great.

In all groups combined, 93.9% of respondents agreed strongly or moderately with the statement, "I am comfortable retrieving and using information electronically." Agreement by faculty members (91.6%) was almost as extensive as agreement by graduate students (94.8%) and undergraduates (94.6%). Strong-to-moderate agreement about comfort remained above 90% regardless of institutional type or academic field, except for a slight dip to 88.6% in the arts and humanities (restricted to foreign languages and literatures, architecture, and the theory, history, and practice of music and art). In fact, the proportion of respondents expressing comfort with electronic information was less than one percentage point below the proportion (94.8%) agreeing strongly or moderately with the statement, "I am comfortable locating and using print information."

A high overall proportion (94.7%) also professed strong or moderate comfort with using their institutions' Web sites. Agreement on that ranged above 90% across the board except for students and professors of law (88.7%). Moreover, 55.1% of all respondents agreed, at least moderately, that "I can find everything I need on my institution's Web site." Graduate students and particularly undergraduates agreed with that statement more than faculty did, and all respondents at liberal arts colleges slightly more than at universities. Also, nearly a quarter of all graduate and undergraduate student respondents—and more than that of undergraduates alone and of all students in business, engineering and social sciences—said they were participating to some degree in their institutions' distance-learning opportunities.

Respondents were asked a series of questions about whether they used electronic resources "all," "most," "some," or "none of the time" in research, teaching, and course work. As shown in the table below, substantial proportions of respondents in all categories said they used electronic resources all, most, or some of the time.

	% who use electronic resources in research	% who use electronic resources in teaching	% who use electronic resources in coursework
all or most of the time	41.7%	21.9%	42.8%
some of the time	55.5%	67.1%	52.0%

The seeming comfort and substantial use that these figures express is reinforced by evidence from the survey that faculty and students in the higher-education institutions surveyed are well equipped to find and use digital resources. In their offices, 95.4% of respondents (mostly faculty and graduate students) said they had desktop computers; 89.2%, laser printers; 77.8%, fax machines; 71.3%, scanners; and 56.3%, laptops. In off-campus residences, 85.4% of all three groups combined reported having desktop computers; 44.2%, laser printers; 44.8%, scanners; 31.3%, fax machines; and 62.0%, laptops. A quarter of undergraduates (24.8%) reported living off-campus, where 92.5% have desktop computers, 31.2% have fax machines, and more than 40% have laser printers, scanners, and/or laptops.

As we will see, respondents do not all view Internet sources uncritically, and they generally express more faith in information they obtain from their libraries. Nonetheless, the survey indicates that high proportions of faculty and students in all fields

and types of institutions feel comfortable with electronic resources, use them substantially, and are relatively well equipped to do so. Does that mean that print use is correspondingly declining?

Print vs. Electronic

Faculty and students were asked how much of the time they use "hard copy print" for their research, teaching, and coursework. For research, 64.5% of the faculty and graduate students said "all" or "most" of the time; and the proportion rose to 73.1% for teaching. Print use in research and teaching was highest for respondents in the arts and humanities and lowest for respondents in law and business. As for coursework, 71.6% of graduate students and 51.6% of undergraduates purported to use print all or most of the time. The latter, relatively low figure could reflect a preference by the younger generation for electronic resources, or availability online of more of what undergraduates need, or both. However that may be, print use in all groups remained substantial, and that seems unlikely to change soon. More than 90% of respondents overall agreed strongly or moderately that "printed books and journals will continue to be important sources for me for the next five years," although graduate students and undergraduates were not quite as concurring as faculty members. For all groups, concurrence about the continuing importance of printed materials was highest in the arts and humanities, but exceeded 80% in all fields.

Nonetheless, 45.3% of faculty and graduate students said that more than half of the information they need for research is available online, and 30.1% said they can get online half or more of the information they need for teaching. Of graduate and undergraduate students combined, 49.4% said that more than half of current information they need for their classes is available online, and within that figure, the percentage of undergraduates who agreed was higher (57.4%). Thus the continued high use of print for teaching and research does not seem to reflect limited availability of relevant digital material.

Almost everyone doing sophisticated research continues to use printed books and journals, but, at the same time, nearly three-fourths of faculty and graduate students said that they use e-journals, and nearly one-fifth reported using e-books. Moreover, though some variation exists by field, more faculty and graduate students overall use online abstracts and indexes in research than use print abstracts and indexes; and slightly more use online databases, data sets, or data sources than use manuscripts and other primary source documents. Patterns are similar for coursework. High percentages of graduate and undergraduate students use printed books and journals, but significant percentages use e-journals and e-books. Also, by significant proportions, more students use online abstracts and indexes than printed ones in coursework, and more use online databases than use manuscripts and other primary source materials. Specific percentages are in the table below.

	% of faculty & graduate students	% of grad students & undergrads
use printed journals	97.2%	80.6%
use electronic journals	74.9%	53.3%
use printed books	96.6%	93.3%
use electronic books	18.4%	19.8%
use print abstracts & indexes	78.3%	59.1%
use online abstracts & indexes	88.2%	73.1%
use manuscripts/primary docs.	81.1%	64.0%
use online databases/sets/sources	81.8%	80.2%

However, the survey turned up another dimension of this story. Although higher education's users of information may frequently consult electronic resources, they are likely to print out what they find. More than three-fourths (77.2%) of respondents agreed moderately or strongly with this statement: "When I find information online, I print it out to read it." The proportion of concurring respondents stayed above 70% regardless of academic field and type of institution. Conversely, only 27.6% agreed moderately or strongly that they "find reading information on screen satisfactory and rarely print out information."

Another perspective comes from a list of survey questions that ask how people "find information about" materials of use in research, teaching, and coursework, and where they "actually get" those materials. For printed books and journals, as well as

for electronic books and e-journals, high proportions of faculty and students do their searching "online" rather than in "print sources" or by asking someone. But high proportions also "borrow from or use in the campus library" the printed resources they identify as useful.

Library vs. Internet

What else does the survey say about the standing of campus libraries as electronic options develop? Survey respondents were asked to what extent they agreed with a series of statements about libraries. Of students and faculty together, 85.9% agreed strongly or moderately that "my campus library meets most of my information needs"; and 55.4% agreed strongly or moderately that "browsing the stacks or journal shelves in a library is an important way for me to get information." However, 34.5% agreed strongly or moderately with the statement, "I use the library significantly less than I did two years ago"; and only 15.7% agreed strongly or moderately that "the Internet has not changed the way I use the library."

Libraries, of course, have changed the way they serve patrons, offering computer-accessible catalogs, digitized collections, and leased access to e-journals and other resources online, while also continuing to provide traditional materials within their walls. How much of the information that students and faculty members use comes from all resources, electronic and traditional, of their institutions' libraries? Nearly two-thirds of faculty and graduate students said that half or more of the information they use for *research* comes from their institutions' physical or virtual libraries; 44.5% said three-quarters or more. Nearly half of faculty and graduate students said that half or more of the information they use for *teaching* comes from their institutions' physical or virtual libraries; 32.9% said three-quarters or more. Two-thirds of graduate and undergraduate students said that half or more of the information they use in *coursework* comes from their institutions physical or virtual libraries; 46.7% said three-quarters or more.

Use of just the virtual resources provided by libraries is substantial. Between half and three-fifths of respondents, depending on the category, said that more than half of the information they use in research, teaching, and coursework is available through the Web sites of their institutions' libraries. And two-fifths of respondents put the proportion of information they use that is available at their libraries' Web sites at three-fourths.

Another indicator of whether library Web sites are used comes in answer to this question: "Once you've gained access to the Internet, how do you usually get pointed to the right information sources?" "Through search engines" was the top answer, cited by 47.6 percent of all respondents, and by more of the responding faculty (47.4%) than of graduate students (39.9%) but not of undergraduates (54.1%). Second choice, however, was "through the library's Web site," cited by 33.1% of all respondents, though less by undergraduates (27.7%) than by graduate students (41.1%) and faculty (31.6%).

In response to another question—"Where do you get the resources you rely on to stay abreast of current knowledge in your discipline or area of study?"—a third of respondents specified their individual institution's "physical academic library and all its resources," and nearly one-third regarded the library as their "most important" source. Slightly fewer (30.0%) said they go to the "open Internet" for resources on which they rely, and 28.7% regarded it as "most important." Both the library and the Internet outranked other information sources. Undergraduates ranked both sources somewhat higher (particularly the open Internet) than did faculty and graduate students.

Although "Internet information" may not necessarily exclude information available online from campus libraries, high percentages of all three groups—faculty (89.6%), graduate students (84.4%), and undergraduates (87.9%)—agreed strongly or moderately with the following statement: "I am finding more relevant information on the Internet than I did two years ago." In no field or institutional type did that proportion dip below 83%.

Critics argue that reliance on the open Internet is dangerous because information found on some Web sites may be factually inaccurate or dubiously interpreted. How discriminatory are academic users? The survey asked, "How do you determine the authoritativeness of the information you receive from

the Internet? That is, how do you decide how much it should influence your current thinking?" The survey reported that only 6.5% of students and faculty combined were "not concerned with authoritativeness," but the figure was higher (10.6%) for undergraduates. Respondents who were concerned with authoritativeness identified the following means of ensuring it:

- *19.1% said they "only reference known sources"*
- *14.0% said they "check with alternative sources"*
- *13.0% said they "trust the author."*

The survey also asked, "How do you verify the information you receive from the Internet? That is, how do you establish the accuracy of the information you receive from the open Internet?" The answers indicate that 3.9% of all respondents, and 4.5% of the undergraduates, "do not verify information."

Respondents who do verify identified two principle means: 39.3% said they "check it against another source," and 20.7% said they "only reference known sources."Responses to another set of questions indicate that information provided by libraries remains more highly regarded than information found on the Internet. High proportions of students and faculty combined agreed moderately to strongly with these statements: "My institution's library

- *contains information from credible and known sources" (98.2%)*
- *provides high quality information" (97.9%)*
- *provides information that I use and cite in my research papers" (94.8%)*
- *provides information that I use and trust without additional verification"(89.0%).*

Significantly lower proportions of respondents agreed strongly or moderately with the same statements about the Internet. Regard for the library seemed high in all disciplines; responses about Internet information varied by field, with regard generally highest in law and business and lowest in the arts and humanities and biological sciences.

Whether "my institution's library" and "the Internet" in the responses above include or exclude the library's online resources is not clear, nor is it certain how much Internet-information use takes place at computer stations that campus libraries provide. But respondents indicated that many of their libraries are well equipped. When asked to identify equipment available in their libraries, 88.3% of all respondents cited desktop computers; 84.6% cited laser printers; and 60.7% cited scanners. If electronic research tools are available in physical libraries, do professors and students continue to spend a lot of time there? Faculty members said they are in their offices nearly three-fourths (73.9%) of the time that they spend "accessing information," and less than 10% of such time in the "physical library." Graduate students said that their information accessing time is 30.0% in the physical library, 25.7% in residences, 19.9% in offices, and the rest in other places such as labs. Undergraduates spend nearly half (46.7%) of their information accessing time in residences and approximately one-third (33.6%) of such time in libraries.

Information Needs

The survey asked, "What additional information content does your library need to provide to meet your needs?" Of all respondents, 41.0% said "nothing" or "can't think of anything." Other responses were scattered over a variety of perceived needs: 14.3% needed more print journals; 10.7%, more e-journals; and, under 8% each, "more books," more "online information," "more computers," or "better organized reference centers."

In response to another question—"What services would you like your institution's library to offer?"—63.1% of all respondents said they didn't know or couldn't think of anything. Others, but no more than 3.3% in any category, said they would like "more electronic materials," "more electronic hardware" such as computers and copiers, and "information available in different locations." A few respondents also asked libraries to provide coffee shops, and lounge areas. Services such as the following to help faculty and students find information received infrequent mention:

- *"selecting high quality online information" (2.4%)*
- *"consultation on organizing online information" (2.0%)*
- *"assistance in library" (1.7%)*
- *"recommending high quality information" (1.3%).*

Whether such low percentages indicate that respondents do not feel the need of such services or already adequately receive them from campus

libraries is not clear. Although 23.8% of all respondents agreed strongly or moderately that "I often can't get information when I need it," only 13.8% said "I need help finding information 24 hours a day, 7 days a week."

Additional data on needs for help in finding and obtaining information comes from another set of survey questions. When faculty and students were asked to identify their *major* problems as information users, 18.1% said "knowing what's available"; 11.0% said "having access to all information from one place"; 10.7% said "determining the quality/credibility/accuracy of information," and 10.4% said "having sufficient training on how to search for information." From 34% to 50% identified those as *minor* problems.

Fewer than 10% of the respondents identified each of the following as a major problem: "finding information," "accessing information once you find what you want," "being able to compare across information alternatives (e.g., library vs. Web sites)," "having training and advice about the effective use of online information sources," "not enough access to networked computers," "getting information in a timely manner," "all information at my institution is not available from different locations within the institution," "not being able to log onto the library's Web site (lines busy, site down, etc.)," "having people who can help you find information or who search for information for you," and one's own "comfort level with electronic information." The proportion of respondents who considered those things minor problems ranged from 17% to 45%.

The item identified by the highest proportion of all respondents as a major problem was "having enough time" (38.8%). "Having to go to a library" was considered a major problem by only 5.7%, though a minor problem by 30.9%.

The survey also asked, "What types of information content does your academic library offer that you find no longer necessary?" Of faculty and graduate students responding (undergraduates were not asked), 76.0% said that "everything is useful" or they "can't think of anything" or they didn't know. Of the rest, 9.5% mentioned "print materials" such as magazines and journals, and 4.2% mentioned "out of date materials"; no more than 2.5% gave any other response. And when asked—"What types of information services does your academic library offer that are no longer necessary?"—92.5% of faculty and graduate students had nothing to suggest.

The survey asked, "What unmet needs for information types and content [from inside or outside the library] do you have?" More than half of all respondents (53.3%) said none, but 26.7% mentioned "more online journals," especially in biological sciences (38.7%), and 4.5% expressed an unmet need for online materials generally. Only 11.6% called for "more print journals" and 2.7%, for "print materials" generally. To the limited extent that respondents are seeking information resources to meet unfilled needs, they seem to hope to find the resources online.

A stronger indication of perceived needs came from a set of questions about how well certain "features" of current sources of information are meeting respondents' needs," such as speed of delivery, ease of access, search functions, search options, subject coverage, quality, and use privileges. Though from 50% to 90% of faculty and students regarded 12 of 15 features on the list as extremely or very important, just roughly half or fewer rated any feature as currently excellent or very good in meeting their needs.

Conclusion

Responses to the survey confirm, in the aggregate, that electronic information use is substantial and growing in the nation's major universities and liberal arts colleges, without much of the "drag" that some might have expected from methodologically entrenched professors and book-loving humanists. Respondents to the survey are highly comfortable with digital resources, are making use of them for research, teaching, and coursework, and have equipped themselves well to do so. One might even be surprised at the proportions of respondents, though still in the statistical minority, who profess to read e-books and to be involved in "distance learning."

However, responses also confirm that print is not dead, nor is the campus library. The data indicate that large numbers of professors and students go online rather than into the stacks to search for resources they need, but then print out or go to the

library to get much of what they use. Libraries themselves make online searching possible by digitizing their catalogs, and increasingly offer collections online as well. Moreover, when people now go to the physical library, it may be to access information through computers, scanners, and printers provided there, with which, the survey indicates, campus libraries are relatively well equipped. If as indicated, some respondents are using the library less than they did two years ago, many others are using it differently.

As for unmet needs, less evidence appeared in the survey of a desire for particular new scholarly resources and services than for easing and speeding the means of search and retrieval. Some librarians may feel concerned that users find libraries' Web sites less easy to use than commercial search engines, which rapidly come up with more sources of information, if at a more shallow and less dependable level. But strong expressions of need for training and assistance in finding information were not abundant. Undergraduates seemed to feel even less need for assistance than others in the survey, though they were more likely than others to ask a librarian (rather than a colleague) for help. The picture is thus mixed, but proponents of such potentially valuable undertakings as providing "information literacy" training—and of making the future library more a finding service than a repository—could encounter "customer" resistance.

To apply such generalizations to anyone's specific institution, however, requires caution. The survey is properly used as food for thought by higher-education administrators, librarians, publishers, service developers, and information technologists. It opens questions to ask about one's own situation: "Given what is happening overall, is our campus adapting in ways and at a rate that is appropriate to meet needs and expectations of our particular students and faculty? What prospects do the data suggest to which we may need to adjust?"

Survey results also open questions for higher education collectively. Given the survey's evidence that digital resources already are extensively available, used, and valued throughout much of higher education, who will ensure their continuing preservation, and how? Given the technological ease with which digital resources can be delivered to any computerized community, how locally focused does it make sense for any content provider to remain? What will it take, in terms of financing infrastructure and digitization, managing digital resources, connecting sources of content, resolving property concerns, and dissolving access boundaries to provide the professors and students of the future with the libraries of the world?

Library Periodicals Expenses
Comparison of Non-Subscription Costs of Print and Electronic Formats on a Life-Cycle Basis

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Abstract

What are the implications of the transition to electronic periodicals on non-subscription library expenditures, such as those required to select, accession, catalog and provide ongoing access and services? New data on staff activities and costs were collected from eleven US academic libraries, and a life-cycle analysis was utilized to study the longer-term cost implications of the transition. We find that, on a per-title basis, the non-subscription costs of the electronic format are consistently and substantially lower than those of the print format. We conclude by considering the implications of the transition to electronic formats—and the consequent favorable cost differentials—on long-term preservation.

Introduction

Many academic and research libraries are in the midst of what may ultimately be seen as a transition of formats for various parts of their collection, from print to electronic. One of today's challenges in providing for the long-term availability of research literature is the need for an acceptable archiving solution for electronic publications. A number of efforts are currently underway to develop such a solution, including work at the Library of Congress, JSTOR, Stanford University, and elsewhere. In designing its business plan, JSTOR's Electronic-Archiving Initiative, with which some of the authors of this article are associated, wanted to learn more about the transition to electronic journals. The study presented here represents part of this effort to learn what effects the transition will have on the higher education community's ability to ensure the long-term availability of electronic publications[1].

For a number of years, it has been noted by observers of library economics that there may be significant cost advantages to moving away from print collections and towards electronic collections[2]. In addition to greater accessibility and searchability, potential cost reduction has been an important motivation for those who envisioned a more electronic future. One set of potential cost differentials comes from subscription costs, and there is a growing literature on the business models and resultant prices that have arisen for electronic periodicals, providing evidence for how libraries' subscription and license costs are changing[3]. But what we will call non-subscription costs, such as staff time, binding costs, and capital expenditures for space, are also important. There has been relatively little formal consideration of how these non-subscription costs may vary with the changing format. This study has therefore sought to examine the changing non-subscription cost structure in the transition towards electronic periodicals[4].

There is good reason to believe that these non-subscription costs vary significantly between the two formats, since processes differ so greatly. Some of the activities unique to the print format are shelving and re-shelving, binding, and long-term stack storage. The electronic format also has processes specific to it, such as negotiations, licensing, and establishing and maintaining access to the resources. In addition, activities that may appear to be similar for both formats, such as collections development, check-in, cataloging, reference, and user instruction, in fact vary significantly in their specific requirements and costs. Finally, a number of the activities for print collections (including binding and maintaining adequate storage conditions) contribute to the long-term preservation and access of these materials—or "archiving"; but there are no equivalent expenditures as yet for the electronic

format. Since these non-subscription activities differ so significantly between the two formats, the cost and shape of these activities may have important effects on the transition from print to electronic formats. For further consideration of how the processes appear to differ between the two formats, please see the more detailed version of this study[5].

Our work is not the first to explore how costs change as periodicals are increasingly delivered in electronic format. The most significant work previously undertaken with regard to how periodicals costs vary between print and electronic formats is by Carol Hansen Montgomery, under whose leadership the Drexel University library system has radically shifted its periodicals collecting away from the print format to electronic[6]. Our effort has collected data from more libraries and focused its attention somewhat differently. We focus strictly on non-subscription costs, thereby excluding the actual costs of the subscription or license. We also set aside measures of "value," such as those derived from the level of usage. In addition, we make use of a life-cycle model for data analysis, similar to the original life-cycle work that was conducted by the British Library, allowing us to compare over time the costs of the format choice[7].

We believe that the cost comparison on the life-cycle basis can permit libraries to become better informed about how a transition from print to electronic periodicals may impact their costs. At the same time, one should keep in mind—as we have tried to do in this study—that there are limitations to the available data. Nevertheless, we hope that this study will be viewed as a contribution towards informing discussion of the choices facing libraries and academia in this time of transition.

Data Collection

Our dataset includes data related to the non-subscription costs of periodicals from eleven academic libraries. Drexel University agreed to permit its mostly pre-existing data to be utilized within a modified methodological approach. In addition, King was independently organizing a somewhat similar study at the University of Pittsburgh, which agreed to permit the use of its data in this study. From the remaining nine libraries, we collected data directly[8].

In recruiting library participants, we sought a diverse group of institutions in terms of size, affiliation, and degree of commitment to electronic resources. For the purposes of comparative analysis, we have categorized these institutions, based on their Carnegie Classifications, as small, medium, and large, as shown in Table 1.

Table 1. Size Categorization of Participating Libraries

Small	Medium	Large
Bryn Mawr College	George Mason University	Cornell University
Franklin & Marshall College	Drexel University	New York University
Suffolk University	Western Carolina University	University of Pittsburgh
Williams College		Yale University

A number of the participating institutions are relatively decentralized. Professional schools often administer their own libraries, and all of the large institutions have more than a dozen library locations on campus(es). Consequently, several participants chose to collect data only for certain collections, avoiding some of the school or departmental libraries, as indicated in Table 2.

As a result, some of the large medical, science, and law collections are excluded from the study. Many of their periodicals are very lengthy in terms of issues and pages per year. One known implication of excluding these collections from the study is to reduce the average cost of binding and storage space for the print collections. This is important and will lead us—especially in the life-cycle analysis—to underestimate the print costs for Cornell, NYU, Pitt, and Yale[9]. Science collections may also behave differently in other ways that would have implications for circulation and reference services in the print format, and across the board for electronic. We have no reason to believe that this would have any meaningful implications for the cost comparison in either direction. It is perhaps also worth pointing out that all the collections included in this study of the participating libraries are open-

Table 2. Periodicals Collections under Examination at Each Participating Library

Participant	Print Subscriptions in Collections Examination as a % ofInstitutional Total	Comments
Bryn Mawr	100%	
F & M	100%	
Suffolk	45%	Includes the Mildred F. Sawyer Library, the main facility, but excludes the law library.
Williams	95%	Excludes several departmental libraries.
Drexel	100%	
George Mason	73%	Includes all libraries except law.
Western Carolina	100%	
Cornell	66%	Includes these Ithaca libraries: Africana, Annex, Engineering, Fine Arts, Hotel, Management, Mathematics, Music, Olin/Kroch/ Uris, Physical Science. Excludes law and medicine, among others.
NYU	62%	Bobst Library only for print holdings categories; Bobst, Courant, Institute for Fine Arts, and Real Estate Institute for electronic. Excludes law and medicine, among others.
Pitt	85%	Includes 5 campuses and 19 complete departmental libraries. Medical (health sciences) and law libraries are excluded.Yale51%Sterling Memorial Library only, includes major humanities and area studies collections. Excludes sciences, law and medicine, among others.

stack[10]. Finally, with one exception (noted in Table 2), the collections under examination at each institution were identical for both print and electronic formats.

Data collection took place during the first half of 2003. Staff contacts at each library[11]. gathered institutional statistics and spearheaded the distribution of activity logs to all library staff who spend any amount of time on periodicals-related activities. The activity logs required staff to report the proportion of time they devoted within a specified time period to each of 15 periodicals-related categories, segmented by holdings category—for a total of 60 possible activities. With one category excluded (explained below), 14 categories of data that are included in this report are:

- *Collections Development*
- *Negotiations and Licensing*
- *Subscription Processing, Routine Renewal, and Termination*
- *Receipt and Check-in*
- *Routing of Issues and/or Tables of Contents*
- *Cataloging*
- *Linking Services*
- *Physical Processing*
- *Stacks Maintenance (including current issues areas)*
- *Circulation*
- *Reference and Research*
- *User Instruction*
- *Preservation*
- *Other*

Some cost categories are not included, but we do

not believe their absence to have meaningfully affected our results. Most importantly, we excluded from our analysis the costs of electronic infrastructure and support. We did not exclude these costs without careful consideration. One problem raised by these costs is that they are very difficult to allocate directly to periodicals in general and to print or electronic periodicals more specifically. Although most of the libraries in this study were therefore unable to allocate these costs directly, it was possible to develop estimates for several schools—Drexel, George Mason, and Pitt. In these cases, including the electronic infrastructure costs does not meaningfully impact our findings, although they tend to increase the relative cost of the electronic format somewhat. Because we could not develop estimates for all the participating libraries, however, we elected to exclude the electronic infrastructure costs from all the data that we present across the board. More information on the electronic infrastructure costs for these three schools is reported in our forthcoming report from the Council on Library and Information Resources (CLIR). In addition to this cost area, we did not attempt to collect data on interlibrary lending and borrowing[12].

For the space occupied by periodicals, it was very difficult for the majority of the libraries, with their mature library buildings, to calculate the actual costs of the space. We therefore estimate a conservative standard for the cost of space and impose it across the board, identifying one cost for current issues and another for backfiles[13]. For backfiles, we use the construction cost of a high-density off-campus storage facility, which we have estimated at $2.50 per volume in today's dollars[14]. For current issues, we use the construction cost of an on-campus library facility, estimated at $100 per square foot[15]. In both cases, the cost of space was amortized over a 25-year period.

Data Overview

To give a sense of the scale of the libraries participating in the study, we provide an overview of the size of the periodicals collections in Figure 1. The small and medium size libraries have very large electronic collections relative to their print collections. We then, in Figure 2, show the total cost, across all holdings categories, of non-subscription periodicals operations at each of the library participants. As the figures show, there are major differences both within and across our size categorizations.

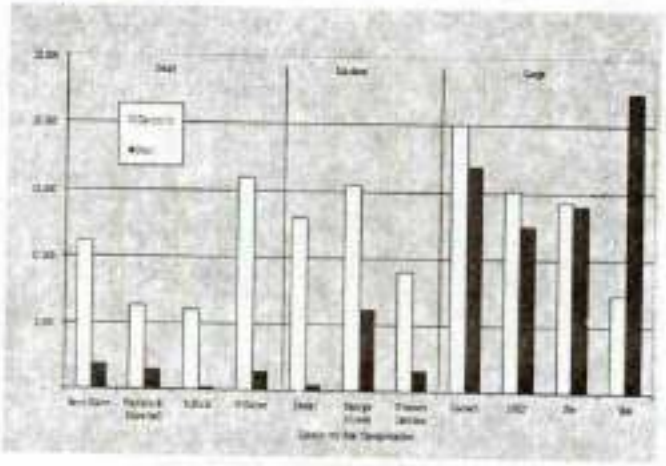


Figure 1. Number of Periodical Titles, by Format, by Library

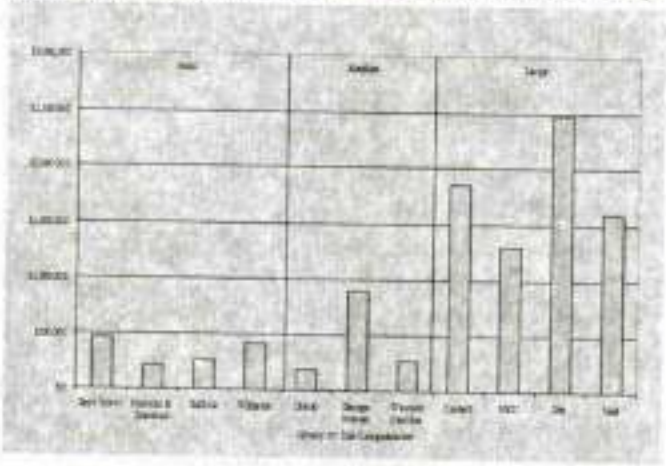


Figure 2. Total Annual Non-Subscription Periodicals Cost, by Library

There are several explanations for differences in the scale of costs. Differences in the size and composition of the holdings of the various collections, along with services provided and patterns of usage, are probably the most important of these explanations. Differences in the processes used to perform similar activities also play a significant role, as do variations in salaries and benefits.

Within these libraries, the breakdowns by format exhibit striking differences. That is, within the total annual non-subscription expenditures shown in

Figure 2, spending by format differed considerably. These breakdowns are shown in Figure 3, in which the libraries are ordered by the percentage of spending that is devoted to the electronic format.

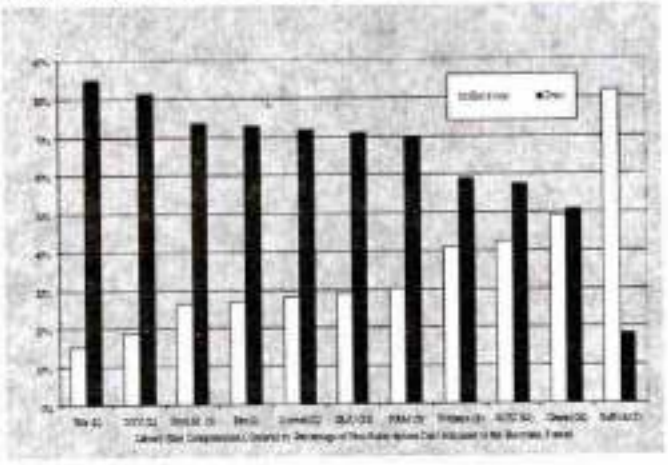


Figure 3. Share of Total Annual Non-Subscription Periodicals Cost by Format, by Library

The two schools with the largest proportional electronic spending, Drexel and Suffolk, have both transitioned away from print and to the electronic format already. It also appears that several of the larger schools, notwithstanding the presence of significant numbers of electronic periodicals on their campuses, continue to devote high proportions of their spending to their formidable backfile collections. The large libraries appear towards the left in part because they have major costs associated with their print backfile collections. In Figure 3, Yale appears furthest to the left because its collections represented in this study are humanities and areas studies alone, the periodicals of which are least likely to be available in electronic format

Data Analysis: A Life-Cycle Approach

Since we wanted to understand the long-term implications of the format choice, we adopted the life-cycle approach. In the life-cycle analysis that follows, we track *the total non-subscription costs over the course of 25 years of accessioning one year of a typical periodical title*. One way to think about this analytical technique is to imagine following one year's worth of a given periodical, tracking its total non-subscription costs over time. The costs reported therefore represent the implicit long-term financial commitment made at the point of acquisitions for a given year of a given periodical item. It is by comparing these total costs over time that we can best compare the non-subscription cost implications of the two formats.

It is important to clarify exactly the purposes for which we intend to utilize the life-cycle approach. The purpose of this exercise is for a comparison between the print and electronic formats at each library. This approach cannot be expected to predict costs for different libraries or for the same libraries operating under alternate procedures or processes. Rather, the life-cycle approach allows us to calculate the costs over the course of time for each of the participating libraries, if they continue to operate under the same set of processes as they do today. Moreover, our focus has been on developing internally consistent measurements at each library allowing for the by-format comparison. Our data are most valuable for this comparison, rather than for examining absolute costs or patterns across the libraries. The findings that this section yields will certainly offer direction and guidance to other libraries, but any number of variables, including different levels of service and usage, lead to variance among the costs of the participating libraries and might cause costs at other libraries to differ from the costs presented here.

Life-Cycle Formulae

Our work involves decomposing the annual cost data presented above into one-time expenditures and recurring expenditures. We then allocate these as they are expected to occur in the first and subsequent years. For costs in subsequent years, we use a discount rate of 5%.

We begin our analysis of print periodicals with the one-time costs, those costs that can be expected to take place only once during the life-cycle. For the typical print periodical, most of these costs are experienced in the first year. They include all activities associated with current issues and certain presumptively one-time costs associated with preparing the backfile volumes. We include one year of the following costs:

- *All staff costs for current issues; plus*
- *Staff costs for those backfiles activities that are*

effectively one-time in nature
  - *Collection Development;*
  - *Licensing & Negotiations;*
  - *Subscription Processing, Routine Renewal, and Termination;*
  - *Receipt and Check-in;*
  - *Routing of Issues and/or Tables of Contents;*
  - *Cataloging;*
  - *Linking Services; and*
  - *Physical Processing; plus*
- *The depreciation of staff workstations, allocated on the same basis as the staff costs; plus*
- *The total cost of binding; plus*
- *The total cost of subscription agents; plus*
- *The cost of space occupied by the current issues reading room during the year.*

The sum of these costs is divided by the total number of current issues titles per library to reach the *one-time cost per title*.

Separately, we determine the ongoing costs. These are costs that can be expected to recur every year for every bound volume of every title. Our approach here is to calculate the total annual ongoing costs experienced by each library. This is determined by summing:

- *Staff costs for backfiles activities that are ongoing, calculated on a $/year basis*
  - *Stacks Maintenance;*
  - *Circulation;*
  - *Reference and Research;*
  - *User Instruction;*
  - *Preservation; and*
  - *"Other" activities; plus*
- *The depreciation of staff workstations, allocated on the same basis as the staff costs; plus*
- *The depreciation of publicly available workstations, allocated at 2% to print periodicals; plus*
- *The annual cost of storage space in an off-campus facility, calculated on a $/year basis; plus*
- *The annual cost of new and replacement shelving, calculated on a $/year basis.*

The sum of these costs for each institution is divided by the number of volumes held in the backfile to reach the *annual ongoing cost per volume*.

We combine the one-time cost per title and the annual ongoing cost per volume that have just been reported to yield the life-cycle cost. Because these two figures are reported on two different unit bases (titles in one case and volumes in the other), we must take an extra step to bring them together in the life-cycle. We utilize the ratio of bindings to titles for this purpose. This is a most important step, because not every print title yields one bound volume per year. Some periodical titles are not bound at all, are not bound every year, have multiple subscriptions, or yield multiple bound volumes per subscription due to their length.

The ultimate life-cycle formula for one title is as follows:

Print Life-cycle Cost = 1**(One-time cost per title)* + Net Present Value of 25 Years of [*(Bindings per title)*(Annual ongoing cost per volume)*]

The life-cycle cost analysis for the electronic format is fundamentally similar, although the structure of the format necessitates some differences. There is no "natural" distinction between current issues and backfiles, which makes some of the distinctions between ongoing and one-time costs less intuitive. We nevertheless were able to group activities by those that are fundamentally one-time in nature and by those that are recurring in nature. This allows us to perform an analysis mirroring our estimates for the print format.

We begin our analysis of the electronic life-cycle with those activities that are expected to take place only once for a given year of a given title. We include one year of the following costs:

- *Staff costs for those activities on the electronic format that are effectively one-time in nature:*
  - *Collections development*
  - *Receipt and check-in;*
  - *Cataloging; and*
  - *Linking services;*
- *An allocation of staff costs for two activities that are principally (we estimate 75%) one-time in nature but have recurring components to them as well*[6]*;*
  - *75% of Negotiations and Licensing; and*
  - *75% of Subscription processing; plus*
- *The depreciation of staff workstations, allocated on the same basis as the staff costs.*

The sum of these costs is divided by the total number of titles per library to reach the one-time cost per title.

For other activities, which are more recurring or

ongoing in nature, we developed a mechanism to spread costs across the multiple years of the electronic periodicals that are available on campus. For these, we assumed that there is an average of five years of content for every electronic periodical currently provided on campuses, so that use of electronic journals over the five years represents use of one-year-old titles, two-year-old titles, up to five-year-old titles. The recurring costs in our data are therefore assumed to be spread across five years.

Of the recurring costs, we first consider separately those that are believed not to vary by usage. These include:

- *Staff costs for those activities on the electronic format that are effectively recurring, unrelated to usage, in nature:*
  - *Routing;*
  - *Preservation; and*
  - *"Other" activities; plus*
- *An allocation of staff costs for two activities that are principally (we estimate 25%) one-time in nature but have recurring components to them as well*[17]
  - *25% of Negotiations and Licensing; and*
  - *25% of Subscription processing; plus*
- *The depreciation of staff workstations, allocated on the same basis as the staff costs.*

The annual expenditure on these activities is divided by the five years to achieve an average cost per title per year, or one year's worth of the annual ongoing costs. We divide this annual total by the number of titles held to reach the *annual ongoing cost per title*.

Finally, there are costs that vary based on the degree of usage. These include:

- *Staff costs for those activities on the electronic format that are effectively recurring, related to usage, in nature:*
  - *Circulation;*
  - *Reference and research; and*
  - *User instruction; plus*
- *The depreciation of staff workstations, allocated on the same basis as the staff costs; plus*
- *The depreciation of publicly available workstations, allocated at 6% to electronic periodicals.*

We call this sum the *use-related cost*, and it is divided by the number of titles to determin the *use-related cost per title*. We expect usage of electronic periodicals to decay over time, as is also typical with print. Our data are, however, believed to include only five years of titles. Recent surveys in three universities suggest that there is only about 21% more use beyond the five years[18]. Thus, the use-related cost per title (circulation, reference and research, and user instruction) is multiplied by 1.21 in the formula.

The ultimate electronic life-cycle formula can now be presented. We have structured it to calculate the costs, over a 25-year period, that are experienced by accessioning one year of a typical periodical title:

Electronic Life-cycle Cost = 1* *(One-time cost per title)* + Net Present Value of 25 Years of *(Annual ongoing cost per title)* + 1.21* *(Use-related cost per title)*

The Life-Cycle Findings

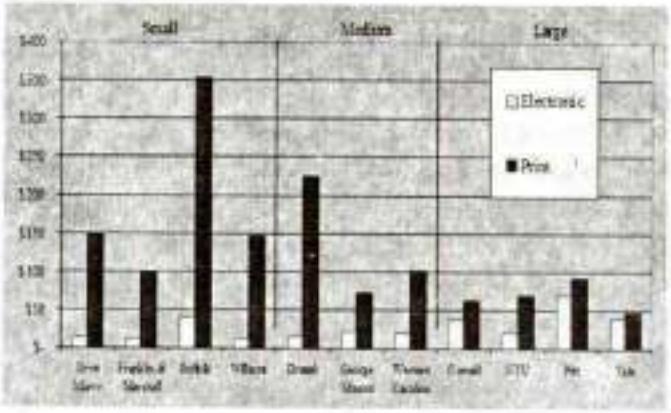
The cost comparison in Table 3 and Figure 4 indicates that the long-term financial commitment associated with accessioning one year of a periodical is lower for the electronic format than for print, at every library included in our study. There is strong reason to conclude that the electronic format brings a reduction in the non-subscription costs of periodicals across the board.

Table 3. Twenty-Five-Year Costs Allocated to Print and Electronic Periodicals, per Title

	Electronic Cost per Title	Print Cost per Title
Bryn Mawr	$13	$150
Franklin & Marshall	$13	$ 99
Suffolk	$41	$353
Williams	$12	$146
Drexel	$16	$225
George Mason	$22	$ 72
Western Carolina	$21	$101
Cornell	$36	$ 63
NYU	$21	$ 71
Pitt	$69	$ 92
Yale	$39	$ 48

Figure 4. Relationship between Print and Electronic 25-Year Life-Cycle Costs

Of great interest in these data, we find that the potential savings are most pronounced at the smaller institutions. This development is consistent with our understanding of these libraries. Because the larger libraries have long benefited from economies of scale in their print operations[19], the relative savings to be



generated from the further economies brought by electronic periodicals are simply not as great. This finding should not be discouraging to the larger libraries, which nevertheless would stand to save, but seems compelling for the smaller libraries, for which there appear to be opportunities to realize roughly the same per-title cost basis as the larger libraries.

This life-cycle analysis has offered a window into the ways in which the non-subscription costs vary on a unit basis. Before reaching any conclusions based on these findings, however, it is necessary to consider—as we now will in the following two sections—how these life-cycle unit costs may impact total library expenditures on non-subscription periodicals costs.

The Total Cost Picture

As we have just seen, the electronic format's substantially lower life-cycle costs, in comparison with those of print, are striking. Other things being equal, our unit cost findings imply that the total non-subscription cost, on a life-cycle basis, will also be lower in the electronic format compared with print. In this section, we first show why we believe this to be the case, and then we offer a number of cautionary notes.

To measure the total potential cost effects of these differentials, we estimate the decrease in the implicit long-term financial commitment under the hypothetical case of a complete transition from print to electronic formats for periodicals. To do so, we simply multiply the number of current print titles by the cost differentials between the print and electronic life-cycle figures. This yields in Figure 5 the amount by which the total financial commitment decreases for every year's worth of acquisitions. We also represent this in Figure 6 as a percentage of the total annual expenditures found in Figure 2.

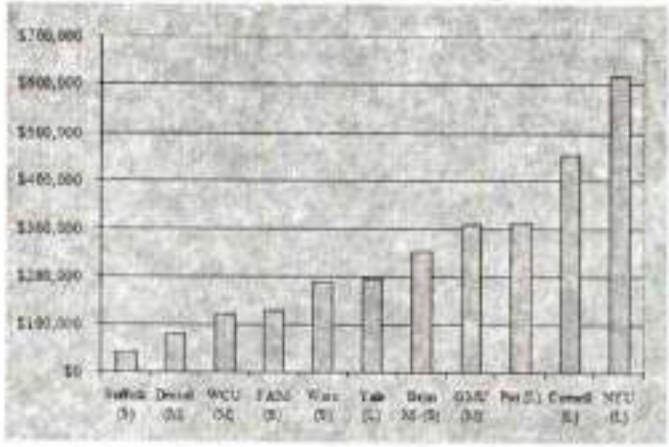


Figure 5. Total 25-Year Life-Cycle Cost Differentials

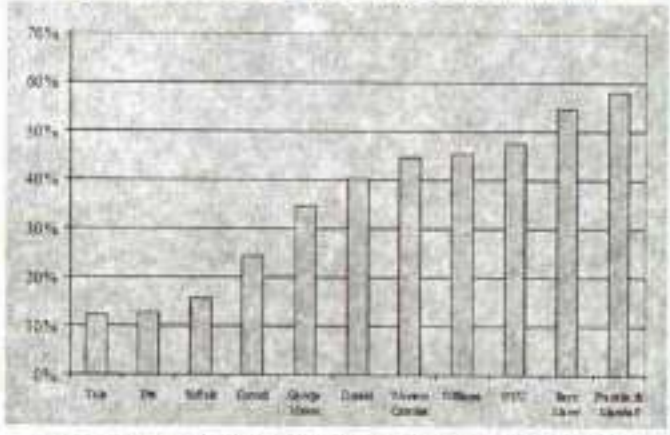


Figure 6. Total 25-Year Life-Cycle Cost Differentials as a Percentage of Annual Non-Subscription Periodicals Expenditures

These figures in these two graphs do not include the collections (including law, science, and medicine) that were excluded from a number of these libraries, which we believe constitutes a downward bias on the total potential cost differential. The total differentials at Drexel and Suffolk (shown in Figure 5) are at the low end of the spectrum because they have already transitioned to the electronic format and there are few remaining print periodicals.

The data reported in the figure assume a complete transition, and of course it may be years, if ever, that the majority of users at many of the libraries in this study would demand (or tolerate) such a complete transition. The data are therefore presented for the

hypothetical case only, to get a sense of the potential scale. During such a transition, if it were to be gradual, the economies of scale on the print format would decline, driving up average costs on that format at least temporarily[20].

One positive note is that a significant amount of the cost differential that this study has documented is attributable to lower staff time expenditures. Unlike savings that result from unbuilt space, which are difficult to realize[21], staff and student worker time may be re-directed or their positions reassigned.

We should note that it might not be possible to recapture the total annual cost differentials listed here. It might not be possible to reallocate all the staff time expenditures in perfectly efficient ways, due to the varying skill sets of individuals and the difficulty of reallocating relatively small amounts of employees' time expenditures. For example, it might be difficult to reassign 2% of a librarian's time expenditures, especially if that person is a skilled cataloger who will not necessarily take on public service tasks during the freed-up period of time. Realizing the full potential cost decreases would therefore pose a significant management challenge.

Before we could conclude with any certainty that cost differentials on this scale could be expected, we would need to know whether the collection size of a given library will grow significantly during the transition from print to electronic and, if so, how. The evidence from several of the libraries in this study—in particular the small and medium libraries—suggests that far more electronic titles are being received than was ever the case with print (see Figure 1). If this phenomenon holds true, then some might be led to conclude that the lower unit costs may nevertheless be offset, at least partially, by a higher total number of units.

While our data is conclusive that unit costs will decline, this section has suggested a number of reasons why local practices will determine the budgetary impact of the potential cost decreases. Where collection sizes do not increase significantly and where efficient procedures and time-reassignments can be implemented, a transition would be expected to have a salutary effect. We believe, on balance, that decreases in total non-subscription costs present the most likely scenario for the future.

Conclusion

The transition to the electronic format seems likely to afford reductions in libraries' long-term financial commitments to non-subscription costs. This is good news for the many libraries that are well along into this transition and would find it difficult to step back. This finding may also be useful to the libraries that have been more reluctant to move towards this new format. Each year, a library that has transitioned to the electronic format for periodicals may have the opportunity to avoid immediate costs and long-term financial commitments on the order of hundreds of thousands of dollars.

We have documented the likelihood that non-subscription costs as *they presently exist* will decline for libraries as a result of the transition to electronic periodicals. The process differences make electronic costs lower than those of print. And it might be anticipated that certain efficiencies for electronic processes have yet to be developed and that electronic non-subscription costs might therefore be expected to decline in certain ways. On the other hand, there is presently a total absence in the electronic format of any costs associated with the long-term archiving of the periodical content.

For the print format, several characteristics have combined to help ensure the long-term archiving of periodicals at many if not all of the libraries participating in this study. First, once a bound volume is accessioned to the collection, it is rarely if ever intentionally de-accessioned. Second, adequate storage space with satisfactory environmental conditions is provided to house the collection, including the periodic expansions of that space. Finally, at several of the libraries in this study, some amount of preservation program costs are devoted to periodicals collections, including conservation, reformatting, and rebinding. Costs associated with these policies present themselves throughout the data on the print format.

For the electronic format, there is no allocation for the equivalent costs. Today, there is no archiving solution in place for electronic materials, although more efforts are being devoted towards developing

possible solutions[22]. While opportunities for tackling this complex and vexing problem may be difficult to identify, this study's focus on the relative costs of the two formats may offer a point of entry. We have documented the extensive efforts in which libraries engage, at great cost, to ensure the long-term preservation of and access to their print periodicals collections. If the library community is to continue to ensure the long-term availability of the resources that it provides, some provision must be made[23]. Just as all manner of non-subscription expenses have been (or will be) re-allocated from the print format to the electronic format, so the cost of long-term preservation and access must also be re-allocated, and our findings suggest that a source exists for such re-allocations.

Because every library has traditionally incurred certain costs associated with the long-term preservation of and access to print periodicals, each will have potentially re-allocatable funds. For example, even a relatively small academic library will not, for the electronic format, need to construct building expansions for periodicals, bind current issues, re-shelve materials after use, or maintain items sitting on shelves. Each library that benefits from electronic periodicals could therefore contribute to the cost of long-term preservation and access. Certainly, if an archiving solution is preventing a given library from making the format transition more fully, it would appear to make sense for that library to be willing to re-allocate funds towards the costs of the solution. If all libraries that benefit make contributions in this key area of work, the costs for any given institution would thereby be lowered by distributing them broadly.

While the archiving solution is yet to be put into place, other observers have noted their belief that the format yields "savings" to which they might like to lay claim. Some publishers appear to be making the case that savings resulting from the transition should somehow be returned to them in the form of rising prices. Similarly, some provosts might make the argument that savings should be returned to the general fund rather than re-allocated within the library itself. However, these perceived savings ignore the absent archiving solution coupled with the historic responsibility of the academic library to ensure the long-term preservation of and access to the scholarly resources that it provides. Certainly, libraries should carefully consider the implications of re-allocations deriving from the format transition.

As the format transition continues and resulting re-allocations take place, long-term preservation and access must not become lost in the mix. Moreover, the format transition itself has been hindered at least somewhat by the lack of these broadly accepted archiving solutions for the electronic format. While the perfect system of archiving solutions is not yet in hand, a number of initiatives are under way in the United States in the university, the federal, and the not-for-profit spheres, any of which will require supporting resources. And many libraries are waiting for an opportunity to participate in an appropriate archiving solution. But perceived library "savings" in the short term must not crowd out the library community's ability to ensure the availability of such archiving solutions in the coming months and years. If appropriate solutions are developed and funds made available to support them, the transition to the new format will be a much smoother one, and the long-term preservation and access of these resources can be assured.

Notes and References

1. This study was funded by The Andrew W. Mellon Foundation. We have benefited from the helpful comments of William G. Bowen, Rebecca Griffiths, Kevin Guthrie, Jennifer Horner, Richard E. Quandt, Susan Lane Perry, Emily Ray, Abby Smith, Dan Terpening, and Donald J. Waters. Thanks to Lisa Bonifacic, Matt Herbison, and Susanne Pichler for research assistance.

2. For a number of papers that touch on this matter, on all sides of the issue, see Richard Ekman and Richard E. Quandt, *Technology and Scholarly Communication* (Berkeley: University of California Press, in association with the Andrew W. Mellon Foundation, 1999).

3. See, for example, *The Consortium Site Licence: Is It a Sustainable Model?* (Oxford: Ingenta Institute, 2002); Kenneth Frazier, "The Librarians' Dilemma: Contemplating the Costs of the 'Big Deal'," *D-Lib Magazine* 7, no. 3 (2001), available at <doi:10.1045/march2001-frazier>; International Coalition of Library Consortia, "Statement of Current Perspective and Preferred Practices for the Selection and Purchase of Electronic Information," (2001), available at <http://www.library.yale.edu/consortia/

2001currentpractices.htm> . For additional references, a good source is Richard E. Quandt, "Scholarly Materials: Paper or Digital?," *Library Trends* 51, no. 3 (2003).

4. Wherever the term "periodical" is used in this report, we use it to refer to the widely accepted definition: "A serial publication that contains separate articles, stories, other writings, etc., and is published or distributed generally more frequently than annual." This is the 006 code for Type of Continuing Resource that appears in OCLC's *Bibliographic Formats and Standards*, Third Edition, available online at <http://www.oclc.org/bibformats/pdf/ffc.pdf>, at page 73.
5. Forthcoming from the Council on Library and Information Resources.
6. Carol Hansen Montgomery and Donald W. King, "Comparing Library and User Related Costs of Print and Electronic Journal Collections: A First Step Towards a Comprehensive Analysis," *D-Lib Magazine* 8, no. 10 (2002), available at <doi:10.1045/october2002-montgomery> Carol Hansen Montgomery, "Measuring the Impact of an Electronic Journal Collection on Library Costs: A Framework and Preliminary Observations," *D-Lib Magazine* 6, no. 10 (2000), available at <doi:10.1045/october2000-montgomery>. Carol Hansen Montgomery and JoAnne L. Sparks, "The Transition to an Electronic Journal Collection: Managing the Organizational Changes at Drexel University," *Serials Review* 26, no. 3 (2000), available at <http://www.library.drexel.edu/facts/staff/dean/Serialsreview.pdf>. Donald W. King et al., "Library Economic Metrics: Examples of the Comparison of Electronic and Print Journal Collections and Collection Services," *Library Trends* 51, no. 3 (2003).Another recent article has used a different approach to project the cost differentials: Lynn Silipigni Connaway and Stephen R. Lawrence, "Comparing Library Resource Allocations for the Paper and the Digital Library: An Exploratory Study," *D-Lib Magazine* 9, no. 12 (2003), available at <doi:10.1045/december2003-connaway>.
7. Andy Stephens, "The Application of Life Cycle Costing in Libraries: A Case Study Based on Acquisition and Retention of Library Materials in the British Library," IFLA Journal 20, no. 2 (1994). Andy Stephens, "The application of life cycle costing in libraries," *British Journal of Academic Librarianship* 3, no. 2 (1988). Helen Shenton, "Life Cycle Collection Management," *LIBER Quarterly* 13, no. 3/4 (2003). Our thanks to Ms. Shenton, and her colleague Stephen Morgan, for a series of valuable conversations while both our studies were underway.For another recent application of the life-cycle approach, see Stephen R. Lawrence, Lynn Silipigni Connaway, and Keith H. Brigham, "Life Cycle Costs of Library Collections: Creation of Effective Performance and Cost Metrics for Library Resources," *College & Research Libraries* 62, no. 6 (November 2001).
8. For a more detailed view of the methodology, including the data collection instruments themselves, please see the extended version of this study that is forthcoming from the Council on Library and Information Resources.
9. Another implication is that we may have excluded copies of print subscriptions that are duplicated at collection not included. This may also have the effect of biasing down the cost of print at any libraries that have significant duplication across print collections that are and are not included in our data.
10. A library such as the Humanities and Social Science Library of the New York Public Library that is closed-stack would presumably have higher print-related costs. Similarly, any special collections that were closed-stack, even at a library whose main collection is open-stack, might be expected to experience higher costs.
11. Our thanks to Berry Chamness at Bryn Mawr; Ross Atkinson, Jim LeBlanc, and Karen Calhoun at Cornell; Carol Hansen Montgomery at Drexel; Marty Gordon at Franklin & Marshall; Aaron Hartman and John Walsh at George Mason; Arno Kastner at New York University; Sarah Aerni, Fern Brody, Matt Herbison, and Amy Knapp at Pitt; Robert Dugan and Becky Fulweiler at Suffolk; Clarissa Fisher at Western Carolina; Sandy Brooke and Dave Pilachowski at Williams; and Ann Okerson and Marcia Romanansky at Yale. Space limitations prevent us from recognizing the many other contributors from each participating library without whom this study would not have been possible.
12. When initiating a borrowing request, a patron does not understand an item to be missing from the local print materials or from the locally-provided electronic materials, but simply from the periodicals collection as a whole. Consequently, it is not possible to allocate ILL by format or holdings category. Its costs do not affect the relative costs of the formats and are therefore excluded from the study.
13. For a consideration of the costs for libraries that store all their backfiles on campus, please see the extended version of this study that is forthcoming from the Council on Library and Information Resources.
14. Because several of the libraries have in recent years opened (or begun to participate in) off-campus high-density shelving facilities, it seemed that for them—and eventually for many of the others—a new backfile volume accessioned would be shelved off campus or would displace an existing item to the off-campus facility. The cost of space in such a shelving facility would therefore be a reasonable proxy for the cost of space for all backfiles. In reality, backfiles today are usually shelved on campus, so, in using the off-

campus space for these calculations, we derive figures that are far more conservative than the actual costs of the space generally occupied by backfiles.

15. We used the reported construction costs of several of the libraries to create this cost estimate, although in the past several years estimates nationally for construction costs of new library space have tended to average about $250 per square foot.
16. While the allocation of 75% of these costs here is an approximation, we believe strongly that most of the costs of these two activities on the electronic format are one-time in character. Even though re-negotiations and processing take place on a recurring basis for electronic periodicals, it is important to distinguish new years of a given periodical from previous years. These two categories of "recurring costs" are properly attributed in large measure to the *new* years of the title, not to the previously accessible years.
17. For explanation, see Footnote 16.
18. Surveys were conducted with University of Tennessee, Drexel University, and University of Pittsburgh. Donald W. King, Carol Tenopir, Carol Hansen Montgomery, and Sarah E. Aerni, "Patterns of Journal Use by Faculty at Three Diverse Universities," *D-Lib Magazine* 9, no. 10 (October, 2003), available at <doi:10.1045/october2003-king>.
19. These economies of scale characterize large centralized operations, and a library like Yale, whose data in this study include only the large central collections at Sterling Memorial Library, therefore exhibits such economies dramatically. However, the data for other large institutions, such as the University of Pittsburgh, include, in addition to an extremely efficient central library, a significant number of small libraries (24), spread across multiple campuses, thus exhibiting higher average costs per title. For more detail about the economies of scale that we observe, please see the extended version of this study that is forthcoming from the Council on Library and Information Resources.
20. For more analysis of several plausible scenarios, please see the extended version of this study that is forthcoming from the Council on Library and Information Resources.
21. Re-allocating the cost of unbuilt space is, economically, a sound concept. It is, however, a complex argument to make, except for those cases when shelves are bursting at their seams and expansion is imminent. See Roger C. Schonfeld, *JSTOR: A History* (Princeton: Princeton University Press, 2003), 367-72.
22. Libraries have only recently begun to request licensing terms that provide for long-term access to electronic resources after the subscription period ends. Often long-term access will be guaranteed by the terms of the license, but via an indeterminate mechanism and for an unknown price. Most frequently, this licensing term is expressed as the opportunity to receive tapes, CDs, or other media on which data has been copied. However, budgetary provision is rarely if ever made by the subscribing library for the installation and servicing of these data or more generally for the preservation practices and safeguards for this new medium. Certainly, the location, not to mention the custody, of electronic periodicals today almost always remains with the publisher and rarely with libraries or independent organizations with a mission dedicated primarily to ensuring long-term access. There are a number of important projects underway. The LOCKSS project at Stanford University, the National Library of the Netherlands in partnership with Elsevier, and the initiatives at the Library of Congress are noteworthy developments in the search for acceptable archiving solutions.
23. We are assuming here that costs of archiving will be borne at least in part on the library side, because that appears to be the emerging model (witness, for example, LOCKSS and the Elsevier/KB arrangement). We would note, however, that all the same principles discussed in this section would hold true in a publisher-pays model, since publishers would presumably pay the costs by increasing their prices (at least) commensurately, and libraries would have to be prepared to allocate monies in that direction under such a model.

The Alexandria Digital Library Project

Review, Assessment, and Prospects

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Abstract

The Alexandria Digital Library (ADL) was established in the late 1990s as a response to several perceived problems of traditional map libraries, notably access and organization. By 1999 it had evolved into an operational digital library, offering a well-defined set of services to a broad user community, based on an extensive collection of georeferenced information objects. The vision of ADL continues to evolve, as technology makes new services possible, as its users become more sophisticated and demanding, and as the broader field of geographic information science (GIScience) identifies new avenues for research and application.

A map library on the Web

Maps are perhaps one of the earliest forms of stored, sharable human knowledge. They may have originated as drawings in the mud of cave floors, but by the 16th century had evolved into sophisticated, scaled representations of the surface of the Earth. By the late 20th century the task of mapping the Earth's surface was essentially complete, in the sense that no areas of continents remained blank, though mapping was much less detailed in inaccessible and less populated regions. National mapping agencies such as the U.S. Geological Survey (USGS) maintained and distributed vast numbers of maps: for example, the coverage of the lower 48 states at 1:24,000 scale consists of approximately 55,000 individual map sheets.

The map library evolved as an intermediate storehouse in this system of creation and dissemination of geographic information. On a university campus, for example, it is clearly much more efficient if the map user can consult or borrow a map from a campus map library, rather than having to have one shipped from the USGS warehouse in Denver. In that sense map libraries are analogous to retail stores, acting as central facilities that provide a well-defined service to a local community (Berry, 1967; Goodchild, 2001). On the campus of the University of California, Santa Barbara the map library is unusually extensive, largely because of the strong focus of the campus on research in geography and related disciplines. By the early 1990s it had accumulated several hundred thousand map sheets, plus several million air photos, and a large collection of atlases, globes, and other forms of geographic information. The map library was thus an important and prestigious component of the UCSB library system.

While map libraries often function well within larger library systems, they are distinct in a number of important ways. First, they are more specialized, and not every library has or can afford a large map collection; where they exist, map collections are therefore highly valued. Second, maps, images, and globes present assorted problems of storage, due to their size, their cumbersome physical form, and issues of preservation.

Third, they are notoriously difficult to catalog in the traditional author/title/subject paradigm of classification (for an early article on automating map catalogs see Goodchild and Donkin, 1967). The most obvious basis for search and retrieval of maps and related objects is geographic coverage: a user is typically looking for a map of *somewhere*. But geographic space is continuous rather than discrete, and an assortment of methods are used for defining geographic location, including coordinates (latitude and longitude), placenames, and various indexing schemes. Information about the City of Goleta may appear on a map titled "Santa Barbara County", and will not be found in a title search for "Goleta" unless the nesting relationship between the two geographic entities has been coded or can somehow be inferred.

The Alexandria Digital Library Project began in 1994 as an attempt to address these three problems, building on earlier work on automating the UCSB map library catalog. If both the catalog and the content of the map library could be automated, then

all three problems could be addressed: users would be able to use the library remotely, leveraging the library's investment by extending access to it globally; digital storage would resolve issues of preservation and the management of physical media; and an automated catalog would be capable of finding information by geographic location. A five-year grant was obtained from the National Science Foundation under its first Digital Library Initiative, and work started in earnest in late 1994. Off-the-shelf GIS (geographic information system) software was used to construct rapidly a proof-of-concept prototype, guided by concepts that had been explored in a previous geoinformation project sponsored by the Research Libraries Group (1989).

Implicit from the start of the project was the notion that research in digital libraries must occur simultaneously with implementation, because ideas evolve much more rapidly when thinking is combined with doing. Several new and powerful ideas evolved almost immediately as this process began, though they were not part of the original vision of the proposal to NSF.

First, the Web arrived and was popularized, providing a far more effective vehicle for access, search, and dissemination, so plans were rapidly switched to an HTTP-based approach.

Second, distributing the prototype to potential users led to a stream of useful feedback, and guidance on the appropriate design of the user interface (Hill *et al.*, 2000). It became quickly apparent, for example, that it was not enough to present users with a map and to expect them to identify an area of interest on it, because in many cases users simply lacked the necessary skills to work with maps. Scale or level of detail also turned out to be a difficult concept for many users.

Third, the team recognized that its concept of search based on geographic location could be generalized to apply not only to maps and images, but to any information objects that possessed geographic references or *footprints*, by being associated with points or areas on the surface of the Earth. This includes collections of georeferenced photographs (e.g., Microsoft Research, 2004), reports relating to specific areas, news stories about places (e.g., MetaCarta Inc., 2004), or even pieces of music (e.g., Mussorgsky's *Pictures at an Exhibition*, which contains musical references to Limoges and the Tuileries and Catacombs in Paris). The project coined the term *geolibrary*, for a library containing georeferenced objects and with a search mechanism based on geographic location as the primary search key. The National Research Council was persuaded to sponsor a workshop to flesh out the concept, and a book reporting on the workshop was subsequently published (NRC, 1999).

The concepts pioneered by ADL in its early years were later adopted in a large number of other projects, and many sites now have the characteristics of a geolibrary. The most prominent of these is, of course, the ability to search by geographic location as represented by latitude and longitude coordinates, a concept that is entirely new to the library community. Geographic space is continuous and multidimensional, and an infinite number of possible locations can be referenced, making it impossible to create a discrete, unidimensional search key analogous to author, title, or subject. Complex relationships such as containment, overlap, and adjacency exist between locations, and while they can be deduced from formal, coordinate specifications they are mostly invisible in informal, placename-based specifications. A geolibrary can only exist in a digital world, therefore, and it remains one of the most powerful concepts to have come out of digital library research. Three methods for specifying location are in common use in geolibraries: visually, by interacting with an onscreen map; formally, by specifying location in some appropriate coordinate system, typically latitude and longitude; and informally, by placename. In the last case, the library must then invoke a *gazetteer service* to convert the placename to coordinates, and will normally do so in a dialog with the user because of the need to resolve inherent ambiguities (multiple places with the same name, spelling variations, diacritical marks, variants in Romanized placenames from Arabia or China, etc.).

The current operational version of ADL offers a Web-based service to users worldwide. The catalog of the central UCSB collection currently contains over 2 million entries, and many of the UCSB catalog entries point to online objects that

collectively amount to several terabytes. The catalog is based on a defined set of characteristics compatible with the U.S. Federal Geographic Data Committee's *Content Standard for Digital Geospatial Metadata* (FGDC, 1998) and with MARC. The gazetteer contains over 4 million entries compiled from Federal and other sources. ADL middleware has been constructed to be interoperable with other collections and catalogs, and the trend in recent years has been to move ADL away from a single, monolithic collection to a complex of smaller, more homogeneous, and distributed collections that can be accessed and searched transparently in a globally effective digital library. In turn, this decentralization has allowed more sites to participate in the collection-building process.

ADL has added very significant value to the UCSB map library, particularly to its collection of historic air photos, and is used worldwide for a dazzling array of applications. Lawyers, for example, frequently use the collection to prove or disprove theories about the historic use of land. In a recent Southern California case, air photos were used to establish the amount of water used for irrigation in an area that had triggered a sudden landslide, causing substantial property damage. The photos were able to show that irrigation had been common practice for years before the landslide and that landslides had been common both before and after irrigation. ADL allows users to pay a virtual visit to the library without spending the time to travel, and to search its collection much more effectively than would have been possible in the pre-digital era. These user services now provide a substantial and welcome revenue stream to the library, and users benefit from efficient access to georeferenced materials previously available only by visiting the library in person, searching manually through the collection, and physically copying items of interest.

Updating the vision

ADL implemented a vision of the map library not as a physical resource to which users must travel to obtain geographic information, but as a virtual resource accessible and searchable from anywhere. While it vastly improved access to the library, and hence the library's value, it did little to escape the conceptualization of the library as a warehouse of information objects, and it perpetuated the notion that user needs can be satisfied by describing and providing access to such objects. Georeferenced objects range in size from Kbytes to Gbytes, but are essentially treated as packages with descriptive labels in this model—in no way does the library interact with the contents once they have been described.

One consequence of this approach is that no effort was made in ADL to register objects to an Earth coordinate system, beyond capturing the bounding coordinates to sufficient accuracy to enable search. Accurate *georegistration* is a requirement if datasets are to be overlaid automatically on other datasets, and this is one of the strengths of GIS. But users of ADL datasets whose applications require them to combine the ADL data with other data would have to engage in a potentially difficult and lengthy process of accurate registration before the data could be used. Lack of accurate georegistration is, of course, not a problem for someone whose application is limited to examining a simple display or printed version of the data.

In the late 1990s, a more advanced vision began to emerge of the role of a digital library. Instead of a simple warehouse supporting search, discovery, and package-handling functions, the digital library was seen as providing a much richer suite of services based on its holdings. In the context of ADL, these might include the ability to generate a user-defined window of data derived from a coverage that the user interprets as continuous, any internal segmentation into map sheets or tiles being hidden from the user's view. A user-defined window might cross the boundaries of these internal objects, but any technical problems created by such instances would be addressed internally and would not in any way impact the user. This clearly requires the ability to open and process the objects in the library before delivery. The vision of ADL could include the provision of a suite of GIS-like services (for a recent introduction to GIS see Longley *et al.*, 2001), using ADL's holdings as the base layers, but processing them to obtain user-defined products. The vision might also include the ability to accept, parse, and resolve plain-language queries based on ADL

holdings, such as "Tell me the names of the cities on the Mississippi River".

In this advanced vision, a digital library takes on the general role of an information service. ADL's special niche would be to provide a service based on geographic information; that is, information linking locations on the Earth's surface to the properties present at those locations. The internal organization of the library's holdings would be largely irrelevant to the user. The vision raises a host of questions, from user-interface issues (could the interface be simple enough to empower an average library user, rather than an expert in GIS?) and technical issues (what internal structures and indexing schemes could support such an advanced design?), to institutional issues (how should intellectual property be addressed when products are obtained from original sources by complex processes?). In this new role, the library becomes a source of assurance of data quality, a brand that is automatically attached to all of the information that flows from the library. The library's acquisition policy must provide the basis of such assurance, and documentation of the lineage of outgoing information, of the processes by which such information is obtained, becomes critical.

To date, ADL's user-interface designs have assumed access through a standard browser, with a screen of typical desktop size. Increasingly, however, geographic information services are being delivered through much smaller devices, including PDAs (personal digital assistants) and cellphones. The growing field of *location-based services* is concerned with providing information through mobile devices that 1) know where they are, and 2) modify the information they provide accordingly. So, for example, a "yellow-page" service allows the user of a cellphone to generate a map of the businesses nearest to his or her current location, to display the map on the cellphone's screen, and to interact with it (e.g., by zooming to greater detail). This is enabled by systems that track the location of the cellphone, using GPS (the Global Positioning System) or by various kinds of triangulation from cellphone towers. Location-based services (LBS) include those provided by in-car navigation systems, and rely on wireless services to provide such systems with real-time information on congestion. For a recent review of LBS and related technologies see Peng and Zhou (2003).

Such systems constitute a form of *augmented reality* (AR) that contrasts sharply with the virtual reality offered by standard desktop environments, which visit distant places only through the medium of geographic datasets. In AR, information from the database is provided on-site through some kind of mobile device, and serves to augment the information directly available to the user through the senses and from memory. AR systems are particularly powerful when the senses fail—when a construction crew digs blindly in a street and hits an invisible, buried pipe whose location is known through a GIS database, or when a driver using an in-car navigation system finds a business located out of sight on a side street. The most advanced AR systems are wearable and *heads-up*, superimposing visual information directly on the user's field of view.

In this context, the library becomes a much more important player in the information society than is suggested by its traditional role of delivering information contained in pre-assembled packages such as books or map sheets. To a degree this has always been true—the library never had a monopoly on the provision of information to society. But it becomes a critical issue in any discussion of the library's future: what kinds of information should a library provide in a digital world, and to what extent will the metaphor of the traditional library continue to dominate the world of digital libraries? These issues are clearly much broader than ADL, but projects like ADL have done much to draw attention to them, and to focus thinking on the evolving vision of the digital library.

Impediments and encouragements to progress

Michael Wegener once wrote that "Everything that happens, happens somewhere in space and time". The location of an event establishes its context and allows it to be linked to other events that have occurred at the same place. In that sense, it is important that an information source—a digital library—be able to answer questions of the type "what information do you have about *there*?" Construction workers need to know about pipes

buried under a specific location; vacationers need to know about hotel options or to know what books in the library are about a given area of interest; researchers need to know about factors that might be causing a disease outbreak; and citizens need to know about proposed projects that might impact their neighborhood.

ADL and similar systems are able to answer these types of queries by serving digital representations of maps, images, reports, and other information objects that cover the location of interest, and whose other catalog properties (theme, date, etc.) suggest relevance to the query. But breaking open the objects, and selecting only the information directly relevant to the query, still lies beyond the capabilities of most current systems. More specialized services are able to address specific queries, but only by limiting them to well-defined domains, such as retail businesses or public transit services. The primary impediments appear to be institutional and cultural, as they often are in times of rapidly changing technology, since the prevailing conceptualization of the digital library is still dominated by the image of the traditional, physical library and its role in assessing, cataloging, storing, and distributing discrete, indivisible information objects. At the beginning of the 20th century, the automobile was described as the "horseless carriage", a way of conceptualizing a new technology by comparison to an earlier one. Similarly the term "digital library" connotes a continuing dominance of the traditional, physical library metaphor; its replacement with a new, distinctive term will only come when the metaphor of the old technology is no longer useful and when the vision has advanced to the point where the old technology is no longer relevant. At the same time, it is important that the new world not lose sight of the multitude of useful functions that libraries perform, in addition to the simple one of supporting search and distribution of information objects.

In this regard, it is significant that the digital world has adopted a model of description or *metadata* that is similarly fixed on the object, rather than on its component parts or on the properties of entire collections. In the traditional world of physical access to map libraries, there was little interest in formalizing the description of entire collections, since there was usually little practical alternative to the local library as a source of information. But in the digital world, where it is equally easy to visit any digital library, collection-level metadata (CLM) is an essential component of any technique for searching across collections to find the one most likely to contain a given object (Goodchild and Zhou, 2003). ADL has developed a CLM structure and implemented it as a major feature of its architecture.

Maps and images are by definition static once produced, and the information delivered through maps tends to be concerned with relatively static properties of the Earth's surface, such as the locations of landforms, roads, and built structures. Maps are expensive to update, since they must be recompiled and reprinted, and the average topographic map sheet produced by the USGS is now over 25 years old. It is difficult to find much attention being paid to time in map libraries, and ADL has, of course, inherited this problem. Although it is possible to search ADL for information objects by date of production, in no way do those information objects inform the user about changes through time, or about dynamic processes operating on the Earth's surface. Nevertheless, the geolibrary concept is easily generalized to time ("what information do you have about *there then?*"), and digital representations of change through time could be stored and disseminated through ADL. Time is also a critical factor in gazetteer services, since placenames change through time, and historic placenames are sometimes lost.

Geolibraries stand to benefit from trends in society that are giving greater importance to place and to geography. The concept of *place-based* research is becoming popular in many disciplines: instead of searching for principles that apply anywhere at any time, this paradigm emphasizes the inherent heterogeneity of environmental and social processes, and the need to understand specific cultures and physical environments. The homogenizing effects of globalization are being countered by trends to localization, and the resolution of issues at neighborhood and community levels. Local information is essential in public administration when general policies and principles must be applied in local conditions. Marketing is

increasingly local, with advertising adapted to the needs and profiles of local markets. In the early days of the popularization of the Internet, it was fashionable to declare the death of location—the global reach of electronic communication would make place irrelevant (Cairncross, 1997). The tide has definitely turned, however: "It was naïve to imagine that the global reach of the Internet would make geography irrelevant. Wireline and wireless technologies have bound the virtual and physical worlds closer than ever." (Economist, 2003).

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Information access in the Information Age: Challenge and Opportunities

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Pinpoints the use of information from times immemorial. Traces the heralding of the Information Age. Discusses new challenges that have surfaced in the wake of ICT – digital divide, information overload, information anxiety and information literacy. summarises the role of libraries in preICT era as a linking mechanism between information sources and patrons. Identifies areas libraries should address in the new ICT environment. Stresses the need for change in information managements concluding that if this change is delayed both libraries and society are bound to suffer.

Key words: *Information society; library automation; digital divide; information overload; information anxiety, information literacy; Information access; Information Management*

1. Introduction:

What is the Information Age that is much talked about every where, every time in all forums now-a-days? Does the phrase convey that we need information in all spheres of human activity today? What about the past, then? Did people in earlier ages not exploit information? History offers enough evidence that they, no doubt, did. There can be no two opinions that people right from the beginning of modern civilization did generate and exploit information. This is but natural. Human beings have a curiosity. They do not accept anything on the face of it. They question, wonder and then go adventuring into the unknown. This is how the human community has reached the present stage of mastery and advancement. In this process they have been exploiting existing information and producing new information – modified or altogether new. Human civilization has been sustained and has advanced because of the consistent use of information, whatever its volume or format. We started with meager amount of information that was recorded on to the clay tablets. With the advancement of civilization the volume of information grew and their emerged other formats which finally settled for print on paper after the famous Gutenberg Revolution in mid Fifteenth century. Scholarly communication, like scholarly pursuits, has had humble beginnings. Handwritten manuscripts were there till the Gutenberg Revolution streamlined it with modern book in print on paper format.

However, the Industrial Revolution found the book lacking the speed that was needed for diffusion of information in the new environment. Thus was borne the journal. It was more compact and had the speed that was the requirement then. By the nineteenth century the journal matured into its present shape of publishing papers citing previous related or impacting materials to offer a well-knit framework for scholarly communication. Improvements in communication in the 19th century like telegraphy, telephone, postal delivery, radio etc. all have been in part a response to the need for transferring and processing information. Growth in volume of information and perennial concern for its recording for exploitation, transportation and preservation lend credentials to our belief that information is all pervasive, has always been exploited and has been regarded as a precious resource for progress and prosperity of human life on the planet called earth. The libraries of different hues that have existed from a long past to support and promote access to information and its preservation for posterity too offer ample evidence to the fact that information has always been in use in different

facets of life.

2. Information Age:

What then is new that the phrase Information Age signifies? The arrival of this age was heralded by popular writers on social change like Bell [1], Toffler [2], Berkeley [3] and others. Bell termed the post-industrial society as Information Society. Toffler wrote of a revolution sweeping the society into an 'info-sphere'. Berkeley described the phenomenon as 'Information Revolution'. Today it is a term for a society in which the creation, distribution and manipulation of information has become the most significant economic and cultural activity. It is different from the Agrarian and Industrial society. The machine tools of the Information Society are computers and telecommunications rather than the lathes or ploughs of those societies. It represents a movement that is transforming our way of life: how we work and do our business; how we offer education and conduct research; how we develop skills and competencies; and how we enjoy life. Nassimbeni identifies various cogent points that characterize the Information Society thus:

- The importance of information and the creation of knowledge;
- The prominence of the role of ICT in the production and dissemination of information;
- The use of information networks for the distribution of information;
- The radical changes in people's lives as a result of increasing integration of ICTs into all spheres of public and private lives; and
- The necessity for citizens to be trained in new skills to allow them benefit from the access to massive expanding store of information.[4]

Thus the Information Society signifies the total realization of all people in all walks of life that progress and prosperity of humans, both as individuals and societal beings, is directly proportional to the quality and quantity of information available and its timely and intelligent exploitation. It represents a new approach to the production, storage, distribution and use of information in the wake of the emergence and development of Information and Communication Technology (ICT). It also reflects the impact of IT on citizenship, education, culture, business and every facet of life. Geneva World Summit on Information Society held in December 2003 while addressed a broad range of themes concerning the Information Society adopted a Declaration of Principles and Plan of Action. The declaration recognizes the impact of ICT on society succinctly thus:

> *...Information and Communication Technologies have an immense impact on virtually all aspects of our lives. The rapid progress of these technologies opens completely new opportunities to attain higher levels of development. The capacities of these technologies to reduce many traditional obstacles, especially those of time and distance, for the first time in history makes it possible to use the potential of these technologies for the benefit of millions of people in all corners of the world.* [5]

In this new environment possession of information for use has been substituted by access to information. When we say that we live in the information age, we mean that we live in a time when information is very important in all spheres of human activity for the sustenance and promotion of individual and professional life. Today when rapid developments take place and subjects impact one another freely, it is only through liberal access to information that anybody can face these situations with success. Peoples' information needs are generally recognized as Current, Casual, Comprehensive and Catching up. These four Cs of information needs are well recognised by the society from quite some time in the intellectual environment. Keeping current in one's profession is of utmost importance today as new developments take place in all professions almost every few seconds. If one fails to keep current with these developments one is bound to be marginalized. People need information in day to day intellectual pursuits and thus have a casual need for information. As a person embarks upon a new research or project he/she needs all past and present information for a background study. Finally subjects know no subject boundaries now and impact one another freely and fairly. This has brought about what is generally referred to as disciplinary interdependence. This makes it

imperative to catch up with impacting subjects. In nutshell, this revolution stresses free flow of information and its universal availability without any barriers.

3. Challenges:

However, this Information Society is faced with challenges of its own which obstruct free flow of information and its universal access in many ways. These challenges, pinpointed below, are all new, though some have been there in a different garb for the past two centuries.

3.1 Digital Divide:

Production, organization, archiving and transmission of information before the advent of ICT were restricted to print on paper media. This did not require any technological gadgets for the user to access the information. But today when we exploit information available in digital and virtual formats there is need for ICT gadgets without which access to huge information sources is not possible. We need, for example, computers with adequate peripherals and accessories and Internet connectivity to access information in the new environment. Thus access to information is conditioned by the technology. But availability of the technology shows extreme disparities in different continents, regions, countries and their areas. This phenomenon is now commonly referred to as 'digital divide' which is a matter of international debate and concern from quite some time now. The phrase 'digital divide' refers to the gap that exists in most countries between those with ready access to the tools of information and communication technologies, and the knowledge they provide access to , and those without such access or skills. Unesco and a host of other organizations are ceased of this problem through different programmes. World Summit on the Information Society (WSIS) is attempting to develop a common vision and better understanding of the Information society and develop an action strategy to overcome the problems. It has already organized meetings in Geneva in July 2002, February 2003 and December 2003. Next conference is scheduled for November 2005 in Tunisia. The United Nations Commission on Science and Technology for Development (UNCSTD) while investigating the benefits and risks of ICTs expressed concern that the diffusion of these technologies was extremely uneven throughout the developing world. As a result of this, there is a high risk that those without access to these technologies will not be able to keep pace with those exploiting these technologies [6]. The Bill and Malinda Gates Foundation (BMGF) is building upon the unprecedented opportunities of the 21st century to improve equity in global health and learning. In partnership with a host of civic groups, it undertook a programme to equip public libraries in USA with computers and Internet connectivity to reduce the digital divide in that country. As a consequence, 95% of public libraries offer public access computing and 14 million Americans regularly use these computers. Most benefited are those socioeconomic groups who lack Internet access at home or work[7]. Bill Gates Sr., Co-chair of the BMGF, rightly says: *Today, if you can reach a public library, you can reach the Internet.* The purpose is to bridge the gap between 'Info-rich' and 'Info-poor'

3.2 Information Overload:

Again those who have the information available and the ICTs gadgets to access it, as a consequence of Information explosion, are faced with information overload. Society is being held hostage by a battery of information which threatens to accede out ability to manage it. Some argue that we are inundated with information to the extent that some scientists claim it takes less time to do an experiment than to find out whether or not it has been done before. Statistical estimates have evidence to prove that more new information has been produced within the last three decades, than in the last five millennia. No wonder, a weekday edition of New York Times contains more information than an average person was like to come across in a lifetime three centuries ago. Examples of this information overload are galore.

Lyman and Varian estimate that world

produces 1.5 billion gigabytes of unique information every year. Approximately this equates to roughly 250 megabytes for every man, woman and child on earth or the equivalent textual content of 250 books each [8].

Information overload thus denotes the inability to extract needed knowledge from an immense quantity of information for one of many reasons. It can occur when a person:

- does not understand available information.
- feels overwhelmed by the amount of information to be understood.
- does not know if certain information exists.
- does not know where to find information.
- knows where to find information, but does not have the key to access it.

3.3 Information Anxiety:

The information overload has led to what is now referred to as Information Anxiety — the overwhelming feeling one gets from having too much information or being unable to find or interpret data. Wurman, while taking stock of this irritating situation, writes:

> *Information anxiety is produced by the ever-widening gap between what we understand and what we think we should understand. It is the black hole between data and knowledge, and it happens when information does not tell us what we want or need to know.* [9]

Information anxiety results from our inability to access and extract meaning from the wide accumulation of information available to us. It is rightly said that information itself has no value; it is the communication and sharing of information and its meaning which gives it value. What we need is a better way to manage information without being held hostage by it. If we improve how we retrieve information, then our information anxiety will be reduced. Denning analyses this situation and prescribes remedial measures:

> *The visibility of personal computers, individual workstations, and local area networks has focused most of the attention on **generating** information the process of producing documents and disseminating them. It is now time to focus more attention on **receiving** information, the process of controlling and filtering information that reaches the persons who must use it.* [10]

3.4 Information Literacy:

Then we come across problems in information access and its use. To access information in the proliferating ICT environment calls for peoples' awareness of the use of information and their mastering the skills essential to access and exploit information to their advantage, both in personal and corporate life. Naturally the information literacy is now regarded as the core competency in living a successful and prosperous life in this new age. It calls for becoming conscious about the need and use of information and possessing proficiency in skills essential to locate, evaluate and use effectively and efficiently the information needed in different phases of life. Now it includes 'digital literacy' to encompass skills in handling digital resources and skills such as 'hypertext navigation'. Add to it the skills needed to exploit information in an *ethical* way in the wake of the availability of information in cyber media, Internet in particular.

Naturally the information literate people are those who have learnt to learn, whatever the media or technology. American Library Association has a Committee on Information Literacy and a brief quote from its Report appears to be appropriate.

> *To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information. Producing such a citizenry will require that schools and colleges appreciate and integrate the concept of information literacy into their learning programs and that they play a leadership role in equipping individuals and institutions to take advantage of the opportunities inherent within the information society.* [11]

Thus information literate persons may be defined as competent, independent learner. They can judge well their information needs and

actively engage in the world of ideas. They display confidence in their ability to solve problems and know what relevant information is. They are able to manage technology gadgets to access information in modern information superhighways and download and archive it, take print outs and communicate it to others through electronic means. And, of course, they should be print literate as well because printed word still maintains its utility and it is not possible to eliminate it.

4. *Libraries in the ICT environment*

Historically, Libraries of all hues have been providing a meaningful structure for collection, organization and accessing of information to facilitate accomplishment of all enterprises in which the social beings have been engaged worldwide. These libraries would professionally select and acquire information sources, organize them with a unique professional mechanism and make them available to those who needed them. Naturally, the access to information was conditioned by possession. Further in the hoary past libraries would offer reactive services, in a way services on demand, when patron would physically enter the library and search for information or ask for it. But with the march of time they were prompted to adopt sophisticated, responsive and advanced active services. Yet another dimension of these services was the introduction of customized services tailored to the requirements of the individual patrons.

However, the advent of the Information Age has eroded the dominance and centrality of the print on paper. Electronic information superhighways have emerged as most effective and expeditions ways of information dissemination and access. Philosophy of possession that libraries had been following for a long past has now been substituted by a philosophy of access in the emerging ICT environment. But the importance of reading has not diminished at all. It is immaterial whether one reads from a printed document or from a digital document appearing on the screen of the computer visual display unit. Some people think that with the availability of information on the Internet, the importance of libraries has diminished a great deal. But such thinking is doubtful. Borgman has summed up this situation thus:

> *The claim that the Internet will replace libraries is based on questionable assumptions. These misconceptions often are that all useful information exists somewhere on the Internet, that it is available without cost, and that it can be found by any one willing to spend enough time searching for it.* [12]

The libraries in order to be dynamic and adaptive to the new modes of information generation and access are, however, called upon to exploit ICT in their operations and services. It has become inevitable for them as it offers panacea to many maladies plaguing the library world from quite some time now. The problems facing the information consumers in the wake of the emergence of Information Society pinpointed here earlier also had an impact on these library operations and services. The public perception of libraries as traditional print warehouses also began to change. This situation brought to the fore new components in Information Management revolutionizing the whole gamut of library operations and services. Borgman offers four challenges for rethinking in the role of libraries in the digital age: " how to maintain visibility while being a part of a well-functioning information infrastructure... how to manage collections as they become more hybrid and distributed... how to preserve physical and digital materials... how to take advantage of blurring boundaries between information institutions and information professions." [13]

With these writings on the wall, the library profession, in order to retain its prestigious position in the new social environment has to address the following crucial matters. US and Europe has already made timely advances in this direction. The developing countries too have initiated programmes to gear up their libraries to operate in the new environment.

4.1 Exploiting ICT in Information Management:

The libraries in order to be socially relevant have to exploit and apply ICT intensively in their operations and services to evolve a new

Information Management model. Collection management concept has to be extended to include digital and cyber information resources. Creation and maintenance of portals with relevant information sources selected from net surfing is another case in point that serves as an effective remedy for the information overload the people are wailing about everywhere and for fighting information poverty. Computer workstations with access to Web resources and other Internet facilities constitute an important component in such an environment. The card catalogue is now replaced by Online Public Access Catalogues (OPACs) and WebOPACs to provide remote access to library catalogues requiring standards different from the card catalogue. For this purpose new metadata standards have been formulated. The Dublin Core Metadata Initiative is a notable example.

The traditional classification schemes that have served well the organization of information sources in libraries in manual environment may not work well with the Internet. Some search engines such as Yahoo and Google have adopted adhoc classification systems that allow users to search by media type or document format. Efforts are also now made to improve basic document description beyond the limitations of HTML giving birth to extensible and dynamic mark up languages.

In the services sector the customized information services supplemented by ICT gadgetry has a high prospect in libraries of today and tomorrow. One can easily envisage replacement of stacks laden with print materials by computer workstations with ergonomically sound furniture. The Internet holds a high promise for promoting information services in libraries. Introduction of World Wide Web (WWW) by Tim Berners Lee provided the infrastructure for flexible use of the Internet. The web stimulated the launching of Internet 2 (I2) to introduce much greater bandwidths to ensure better communication and transmission of information. Supplementing the traditional reference sources by portals, webiography and blog technology for netizens is a good case in point.

4.2 Networking:

Libraries have been concerned with resources sharing mechanisms from quite sometime now. Earliest manifestation of this concern has been Inter Library Loan. As the problems facing the libraries intensified from time to time they developed different resources sharing programmes to offer adequate, responsive services to their clientele. Now the ICT has made possible establishing networks of different topologies that ensure expeditious information sharing services. Standards for compatibility are available and networks are now fully abloom at different levels worldwide. India too has made strides towards developing national and several metropolitan networks for library use. Libraries of all hues are now required to work towards networking to reap the benefits of resources sharing in true sense.

4.3 Patrons empowerment:

Libraries have been offering services to their patrons on their arrival in libraries. Later libraries took a U turn — instead of user coming to the library, the libraries began extending services at the workplace of the patrons. But it was restricted to Current Awareness Service and its sophisticated version of Selective Dissemination of Information (SDI) and to a limited extent.

But now with the digital and cyber landscape the library professionals would do well to strive towards patrons' empowerment. This would mean offering information to the patrons at their work stations without any intermediary any time and round the clock. A virtual library with virtual information sources must be the ultimate goal for this purpose. The library personnel shall spend time on surfing the net, sifting relevant information, organizing it on portals and then offer the quality information to the clients wherever they are and whenever they need. They will also develop appropriate retrieval mechanisms to ensure efficient recall and precision. This will go long way to eliminate problems of information overload and information anxiety highlighted earlier.

4.4 Human resources development:

Educating and training library professionals to handle the global information infrastructure to provide responsive, customized information access services to the public is yet another major issue. The ICT have penetrated deep into every facet of library operations and services. The education that used to be imparted in library schools till recently needs to be augmented by ICTs components. The library professionals have to be retrained in the new media as navigators and providers of cyber service to develop competencies so that they are able to perform in electronic and networked environment. They need to be trained in computer hardware, software and networking technologies, and developing digital libraries using software developed for them such as Dspace, Greenstone etc. Library schools worldwide are already seized of this problem and are finetuning their curricula to suit this news environment. University Grants Commission in India too has published the Curriculum Development Committee Report which reflects this change in LIS education in the country. The curriculum, however, has to be reviewed from time to time. This becomes imperative as the techniques of publishing, organizing and accessing information are changing continuously as a result of technological developments, competitive information market place and the growing sophistication of information exploitation in all enterprises. Continuous professional development to keep current with developments that are taking place in the wake of advances in ICT also is essential aspect of professional education.

5. Conclusion:

To conclude, the Information Age is full of opportunities and challenges. Information access in this age calls for transforming the traditional ways, particularly with regard to accessing and exploiting the vast electronic resources that are piling up day in and day out. Libraries too have to change in this new environment to exploit the news technologies to ensure universal availability of information. They have to extend and modify their operations and services and adopt new information management tools and techniques. The challenges posed by the ICT can be overcome by equipping libraries of all hues with adequate technology and providing them training facilities in exploiting them to their advantage. The digital divide can be contained by making these facilities available in public libraries as has been done in US almost all public libraries have Internet facilities. Similarly, Information overload, information anxiety and information literacy problems can be dealt with by involving libraries in combating these challenges, no doubt, in collaboration with other agencies interested in tackling these problems. This is all the more important now as we live in an Information Society set up by the Information Age which has evolved an Information economy. Libraries' role in this society and economy need to be recognized in a true spirit. If we fail to do so, both libraries and society are bound to suffer.

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Citation Analysis of Ph.D Theses
A study of doctoral theses submitted to Kashmir University during 1980-2000 in Natural Sciences

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Abstract

Reports a study of one hundred doctoral dissertations submitted to Kashmir University during the period 1980-2000 in the field of Natural sciences. A total of 11,862 citations were analysed for identifying bibliographic form, citation potential, journal ranking and obscelecence rate.

Keywords: *citation analysis; half life; ranking of journals; citation potential and Bibliographic form*

1. Introduction

While preparing a research paper, review or thesis/dissertation an investigator or a scholar necessarily refers to earlier works which are related to his field. This practice is well established in scientific literature even about three centuries ago when early periodicals started. The lowly footnotes, as the present form of footnotes were originally called attained a position of considerable importance in scientific documentation. The earliest name of the foot name according to Derek de sola price was "sholia" which means "relating to scholarship".[1] This indicates that practice of footnoting was considered to be the scholarly practice. The present investigators have chosen PhD theses in the field of Natural sciences submitted to University of Kashmir during 1980-2000 A. D. for analyzing the citations in order to understand the nature of documents used by scholars, subject distribution, ranking, half life of journal Literature used etc

2. Objectives

The following objectives were set for carrying out the study:

a) To understand the citation potential of the theses and distribution of various sources
b) To understand the use of primary sources and establish a ranked list of journals
c) To find out the obsolescence of the literature used by the scholars.

3. Material and Methods

One hundred PhD theses available in the university (1988-2000) on Natural Sciences were taken from the shelves and citation pages were copied. The data was transferred on cards according to the required parameters guided by the objectives of the investigation .The data was classified, tabulated, presented, analyzed and interpreted with the help of tables and figures.

4. Discussion and Results

4.1. Discipline wise Distribution

The study reveals that out of 100 theses, the maximum number of theses (35%) pertain to physics followed by Botany (32%). The minimum number of theses (17%) relate to Zoology. Subject areas are shown in Table 1and also represented by a pie diagram (diagram. 1)

Table 1. No of theses analysed

S. No	Subject	No of theses	Cumulative no
1	Botany	32(32)	-
2	Chemistry	16(16)	48(48)
3	Physics	35(35)	83(83)
4	Zoology	17(17)	100(100)

* *Figures In parenthesis indicate percentage.*

Diagram 1: Distribution of theses analysed (Subject wise)

4.2.Bibliographic form

Journals are most used bibliographic form accounting for 8,076 citations (68.08%) out of total number of 11,862 citations. The total number of seminar papers cumulate to 1,038 citations (8.750%).The book citations are the least forming 01.47 % while other bibliographic forms like patents, specifications etc record a good percentage of about 9% (table 2). The distribution of bibliographic form, subject wise, (table 3) reveals that Chemistry constitute a highest percentage of journal citations (78%), followed by Physics and Botany. Again physics report a highest percentage of thesis literature (10.97) followed by Zoology and Botany when Chemistry show less use of seminar papers in their theses (01.74%). Chemistry and Botany have about 1345 citations of books in their theses when it is low in other fields. The use of doctoral dissertations is least in all the fields .Its cumulative citation percentage does not exceed to 01.68.

Table 2. Bibliographic form (Natural sciences) during the period

S. No	Source	Total # of citations	Cumulative number
1.	Journal publications	8,076 (68.08)	-
2	Seminar papers	1,038 (08.75)	9,114(76.83)
3.	Books	0,199(o1.68)	10,577(89.17)
4.	Theses	0,174(01.47)	10,751(90.64)
5.	Others	1,111(09.36)	11,862(100.00)

*Figures in parenthesis indicate percentage

Table 3. Bibliographic form in Natural sciences (discipline wise)

S.No Disciplines	Bibliographic form Journal	seminar	books	R. Book	thesis	others	total
1. Botany	2,916 (63.65)	362 (07.09)	606 (13.24)	153 (03.34)	077 (1.68)	467 (10.19)	4,581 (100)
2. Chemistry	721 (78.28)	016 (01.74)	123 (13.35)	010 (01.09)	009 (00.96)	042 (04.56)	0.881 (100)
3. Physics	2,445 (68.95)	389 (10.97)	364 (10.27)	014 (00.39)	034 (00.96)	300 (08.46)	3,564 (100)
4. Zoology	1,994 (70.86)	271 (09.63)	171 (06.08)	22 (00.78)	54 (01.92)	302 (10.73)	2,414 (100)

*Figures in parenthesis indicate percentage

4.3 Citation potential

It is clear from table 4 that out of 100 theses, the highest number of citations i e 450 are only in one thesis when minimum citations range from 1-50 in 15 theses. A large number of theses (32%) contain citations from 51-100 followed by 255 having citations ranging from 101-150. It is also clear from table 5 that theses submitted in the field of chemistry have less number of citations not exceeding 150 in any case. The highest number of theses in the field of Botany (one third of theses submitted) contain151-200 citations, followed by Physics where 50 % theses submitted posses citations from 51-100.This shows a variation in citation potential of Natural sciences and also among various sub- fields of Natural Sciences.

Table4. Frequency distribution of citation potential

No of citations	No of theses
0-50	15
51-100	32
101-150	25
151-200	15
201-50	09
250-300	03
301-350	-
351-400	-
401-450	01

Table 5.Frequency distribution of citation potential (discipline wise)

No of citations	No of theses			
	Botany N=32	Chemistry N=16	Physics N=35	Zoology N=17
0- 50	-	06	09	-
51- 100	07	06	16	01
101- 150	11	02	04	08
151- 200	11	-	02	02
201 -250	02	-	03	04
251- 300	01	-	-	02
301 -350	-	-	-	-
351- 400	-	-	-	-
401- 450	-	-	01	-

4.4 Ranking of journals

The following tables (tables 6-9) show most cited journals in the field of Natural Sciences. A few journals are cited equally by both Botany and Zoology scholars. The core journals are limited to 10 highly cited journals which may form a base for librarians, teachers and scholars in selecting useful journals in their respective subject areas.

Table6 . Ranked list of physics Journals

Rank	Name of the journal	Total citations
1	Physics Review	229
2	Applied *journal of physics*	147
3	Physics review letters	126
4	Nature	121
5	Solar Physics	107
6	Astrophysics	80
7	Journal of chemical physics	62
8	Physics letters	58
9	Journal of Applied Physics	42
10	Journal of physics	39

Table 7. Ranked list of Botany journals

Rank	Name of the journal	Total citations
1	Indian journal of Botanical sciences	99
2	Hydrobiologia	87
3	Taxon	79
4	Indian journal of Genetics	62
5	American Journal of Botany	51
6	Canadian journal of Botany	51
7	Ecology	48
8	Journal of Ecology	47
9	Plant physics	47
10	plant dis .ret	44

Table8. Rranked List of Zoology Journals

Rank	Name of the journal	Total citations
1	Hydrobiologia	92
2	Indian journal of Helminthology	56
3	Journal economic entomology	53
4	Nematolgia	46
5	Journal res .bd. Canada	39
6	Hydrobiology	36
7	Canadian journal of Zoology	33
8	Limn logical Oceanographer	33
9	Indian journal of entomology	32
10	Oriental Insects	26

Table 9. Ranked list of Chemistry Journals

Rank	Name of the journal	Total citations
1	chemical Abstracts	89
2	photochemistry	60
3	journal of Physical chemistry	47
4	Journal of American chemical society	43
5	journal of inorganic chemistry	25
6	Indian journal of chemistry	24
7	Journal of chemical society	22
8	journal of physical colloid interface Sc.	20
9	Inorganic Chemical Acta	19
10	Journal of inorganic Nuclear Chemistry	18

4.5. Obsolescence of literature and half life of journal citations

The analysis of citations by age of cited documents reveal useful life of documents. This period of citations of the journal articles popularly referred as "half Life Of periodicals" or often quoted as "Obsolescence of use of Literature". A chronological distribution of journal citations is given in Table 10. A graph has been plotted based on data of chronological distribution given in the table 10 of periodical citations. Taking the period of years at the interval of five years on X-axis and cumulative number of citations on Y axis. Parallel line from Y axis is drawn from "P" (representing the half the no of total citations) to meet the curve at Q. A perpendicular QR is drawn on X axis. The line "OP" represents the half of the total (4038) citation i.e. Q and the line " QR" represents the half life. The half life period of the journal citations for the present analysis drawn is 37 years.

Table 10. Chronological order of citations

Period of citation	No of Citations	Cumulative citations
1941& Before	100	—
1942-46	421	521
1947-51	622	1143
1952-56	744	1887
1957-61	804	2691
1962-66	605	3296
1967-71	476	3772
1972-76	996	4768
1977-81	752	5520
1982-86	851	6371
1987-91	855	7226
1992-96	764	7990
Unidentified	086	8076

5.Conclusion

The following conclusions are drawn by analyzing about 8,000 citations derived from 100 doctoral theses.

a. The researchers don't not follow standard format for recording the bibliographic details and few citations don't include full bibliographical descriptions for proper identification of the sources cited.

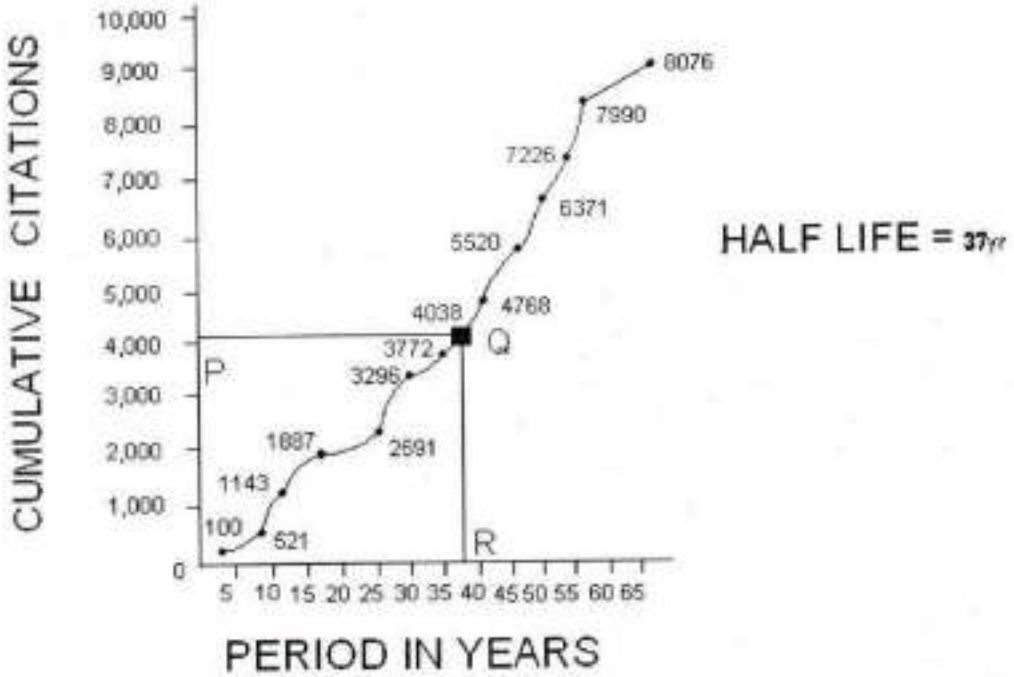
b. The number of citations given in support of literature review is not adequate which does not exceed 50-100 citations in 32 %theses. The field of Chemistry report very less number of citations and hasn't exceeded 150 inclusive of sources repeated more than twice.

c. The highest citations are from journals followed by seminar proceedings which are in accordance with international and national practices in Natural sciences.

d. The half life of journal citations is 37 years. It shows non use of adequate literature in the respective fields. The maximum number of journal use pertain to 1982-91 and 1972-76 which is, on the other hand, significant indicator for the use of recent journals subscribed by the institutions.

e. Hydrobiologia is highly ranked journal of Biology scholars published abroad when Indian journal of Botanical sciences and Indian Journal of Helminthology is highly cited journal of the country. Physics Review and Photochemistry are referred largely by

Fig 1. HALF LIFE PERIOD OF CITATIONS



Physicists and chemistry scholars It is interesting to record that Chemical Abstracts is highly cited and it seems that scholars depend on abstracting service heavily either due to non-availability of primary literature in academic and research institutions etc or high quality abstracts which are adequate that one does not require any further reference to the original source.

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Library & information Science Profession and professional competencies

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Abstract

Libraries ever since their beginning are engaged in the acquisition, processing and dissemination of knowledge, as knowledge is stock-in –trade for librarians. Because of modern technology applied in the libraries, nature of activities performed in libraries has changed to a great extent. With the passage of time all the three ingredients of library viz. documents (in any format), Users (in their behavior) and staff (in their skills) are changing. This paper analyses these changes & lists the competencies being adopted by LIS professionals in order to perform effectively and efficiently.

Keywords: *competencies, skills, library & information professionals, information Technology*

Introduction

Library is a social institution and provides information for education, inspiration and recreation for the enlightenment of the personality of an individual. Libraries also provide support to the social, economic, educational, cultural, technical and technological growth and development of a society and are considered as an indispensable part of the society. We find libraries of different hues serving all sections of the society and have thus achieved important position in a civilized society.

Libraries are service oriented institutions serving as bridges between knowledge generator and knowledge seeker. In the present Information Age the society thrives on availability and exploitation of information. Naturally, the role of libraries and the ways they offered services in traditional environment are progressively being substituted by roles and ways under the impact of Information Communication Technology (ICT). The competencies that library professionals were required to acquire, as a consequence, witness changes day in and day out. The tasks they used to perform manually, the materials they used to handle just in print and the services they used to offer conservatively are being challenged by smooth and efficient application of ICT in whole gamut of library operations and services. Naturally, in order to be enterprising library professionals are called to demonstrate commitment to the values and principles of the profession and augment their competencies with ability to exploit ICT in their operations and services. Chopra while writing about the characteristics of the library profession rightly says:

> *Librarianship calls for a unique combination of various kinds of academic attainments and personal qualities. A librarian is an administrator with out being any less a scholar. He is a scientist without being any less a theoretician. He is a lover of books and he is equally interested in people. He is a scholar, practitioner and a person with an eye on the technology, because all technological advances affect the libraries and their social relevance. These complex qualities call for a comprehensive training.*[1]

To be relevant to the merging social environment the librarian of today is called upon to offer traditional services with a blend of new sources and services available in cyber space. Consequently, he requires elaborate managerial and technological ability of a high order and meticulous devotion to details involved in increasingly demanded and multifaceted library services. Librarianship of today thus is multidisciplinary and encompasses the various fields of human endeavor like management sciences, computer sciences, mathematics, social and behavioral sciences, history etc.

Every profession exists, sustains and flourishes on the basis of a range of competencies that it

evolves for its practitioners. These competencies, as Murphy puts it, are the "interplay of knowledge, understanding, skills and attitudes required to do a job effectively from the point of both the performer and the observer."[2] Webster's Third New International dictionary has defined competencies as "the quality or state of being functionally adequate or having sufficient knowledge, judgment, skill, or strength (as for a particular duty or in a particular respect)."Griffiths talks of competencies in terms of three components viz, knowledge, skills and attitudes i.e. knowledge and understanding of the academic discipline, skills and the moral values and professionalism. Skills involve the ability to perform the various psycho-motor tasks and interaction with others. Professional attitudes compromise the emotive commitment to professionalism and the willingness to perform professionally. [3] Thus competencies are the capabilities existing and attained by a person in order to perform his duties effectively and efficiently.

Libraries in changing environment:-

Library and information scenario is changing at rapid speed. Libraries have changed from mere static store houses of knowledge to dynamic service centers. As such library profession has witnessed transformation after transformation in the wake of changes in intellectual environment, media formats and patrons approach to information. However the basic philosophy behind the services offered by the profession as linking mechanism between the sources of information and the patrons has remained unchanged .What has changed are the professional activities that were impacted by the advances in social, intellectual and technological spheres from time to time. The professional activities with regard to collection development, organization and access have thus undergone changes calling for new competencies compatible with the new environment. Moreover, the physical possession is no more the criterion for services .Availability of oceans of information on Internet makes information available without possessing it. So the possession has been substituted by access.

Changes that have been witnessed in library operations and services in the wake of deep penetration of ICT are many. However, the major ones can be identified as under:

A) - **Increasing impact of technology:-**

In today's world among several developments in information technology, the ones which are directly affecting library and information services are computers. The use of computers and other electronic gadgets has now changed the face of libraries and information centers. Computers are not only used for housekeeping functions but also for recording, analyzing and retrieving of information and also for networking. The new media such as CD-ROMs and other multimedia forms have changed the whole complexion of libraries and information services. Developments in telecommunication have brought the world within the formats of an information village and these provide immense potential for services to be provided by library and information centers. Because of ICT developments, today there are library & information networks operating at international, national and regional levels such as INIS. AGRIS, INFLIBNET, DELNET, etc.

The software packages for automation and networking of library and information centers were developed and provided in terms of functions, user friendliness, efficiency etc. These software packages like ISIS family developed by UNESCO for database management and an integrated version WEBLIS developed by Institute for Computer and Information Engineers in Poland , SOUL, MINISIS, INMAGIC Plus, CAIRS-LMS (Library management software), TECHLIB Plus, Softlink Library Automation Software Packages, Libsys, MAITRAYEE, Tulips, *Librarian*, and Golden Libra etc are now used for automation of all library functions. Much work has been carried out in developing openware software for library integrated programmes by different organizations. Similarly progress has been made in evolving digital library software and open archive software like Greenstone, D-space. E-prints etc .These software packages can be applied to

1. Library operations
   a) Acquisition
   b) Cataloging / OPAC

c) Circulation
d) Serial control
e) Digital archiving

2. Library services.
   a) CAS
   b) SDI
   c) Retrospective / current literature services
   d) ILL services
   e) Document delivery services
3. Internet interfacing

B) Library Management: -

Application of theories of systems analysis and design, Total Quality Management (TQM), scientific management etc are now exploited in libraries in order to improve the overall efficiency and effectiveness both in services and practices performed in libraries.

Thus in addition to the basic core of traditional skills and professional knowledge, today's professionals need a new variety of competencies and skills. If the profession has to retain its role in this new scenario, it has to develop new competencies to deal with new media, new approaches and new technologies. The profession has realized these realities ever since the beginning of this new scenario in the second half of the past century.

Competencies of library and information professionals:-

There is great variety of competencies necessary to accomplish the role of the professional librarian. Competencies are contextual varying with the environmental conditions. Hence they are to be formulated at different levels and continuously modified. Close coordination is required between library & information professionals, educationists and employers to formulate competencies. Library associations at international, national and regional levels are playing an important role in this regard, so as to bring an overall improvement in the profession. An extensive and in depth analysis of literature on the subject reveals that library & information professionals (LIP) should possess competencies related to:-

1. Philosophical competencies :-

— LIP should know the mission and role of the library in the community and the mission of libraries in general.
— LIP should understand the responsibilities and relationship between different departments in the library e.g. technical section, public services and administration.
— LIP should understand that his /her library is a part of large library system and thus cooperation and resource sharing is to be introduced.
— LIP should know the ethics and values of library profession.

2. Technological competencies:-

— LIP should be able to demonstrate basic skills in the use of appropriate software and hardware applications for library functions and services.
— LIP should demonstrate basic skills in the use of audiovisual equipments.
— Demonstrate skill in web page design [1]

3. Educational / professional and personnel competencies

— LIP should seek out and participate in continuing education opportunities in order to keep skills current and up to date. He should be able to integrate new techniques and methodologies into everyday practice.
— LIP should be open to self evaluation and thoughtful evaluation by superiors, peers & customers in order to become a contributing employee.
— LIP should know how information is organized and accessed within his /her library and as such should have thorough knowledge of the collection in the library.
— LIP should get involved in designing curricula and methods to meet the educational needs of clientele [2]

4. Customer service competencies:-

— LIP should understand customer needs and preferences for information which

build and drive the selection of resources and services.

- LIP should always improve customer services in response to changing needs.
- LIP should understand information seeking behaviors and should facilitate the customer's successful information retrieval.
- LIP should act as a user advocate during the development of information products and systems.
- LIP should tailor services and information products to support the user needs.
- LIP should act as a consultant to the parent organization and community on information issues.
- LIP should speak a language that his/her clientele understand [6]

5. Administration and leadership related competencies:-

- LIP should create a culture which promotes change.
- LIP should provide a nurturing climate for staff and an encouraging attitude for their growth and development. [7]
- LIP should be able to develop and implement policies and procedures for the efficient and effective operations of library functions.
- LIP should continually adjust programmes and services to respond to social changes and service opportunities.
- LIP should assess strengths, weaknesses, opportunities and challenges to the organization and develop strategies for dealing with them effectively without compromising vision, mission and values.
- LIP should always help others to achieve their full potential and should also give due value to the contribution of others.
- LIP should be able to set long- and short - range goals, objective and priorities. [8]

6. Information literacy skills:-

- LIP should understand the flow of information in society.
- LIP should find, review and use WWW resources including search engines and databases.
- LIP should judge accuracy of information gleaned from traditional / web based resources.
- LIP should understand basic copyright principles, especially as they relate to electronic resources.
- LIP should understand information issues such privacy, freedom of speech and preservation of information especially as applied to an electronic information environment.
- LIP should know how to access troubleshooting guide online. [9]

As such competencies are to be developed because

A) The changing environment in information storage, organization & access is driving libraries to change and adapt.

B) Users / patrons expectations from libraries are changing.

C) For planning human resources in a library in order to provide qualitative services.

Conclusion:

In the context of the advancement of information technology, library and information professionals are faced with the challenges they encounter in the provision and dissemination of information essential for over all development of human society. The institution that is known as library around the globe has been witnessing changes all through the ages. It is not a new phenomenon. Today the librarian and information professional is imperatively to function, in addition to his conventional practices, as information analyzer, interpreter, facilitator, consultant, advisor etc. Concepts like automated libraries, electronic libraries, digital libraries, virtual libraries point in this direction. Naturally, in this new environment the LIP has to spice his/her competencies with the fast emerging ICT to act both as librarian and cyberarian in this fast growing new environment. The professionals in order to be responsive to new social needs and demands have to master these competencies, failing which they may be marginalized or even threatened to extinction.

Thus it is a matter of survival and sustenance; sooner we realize it, better it will be.

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A Dictionary of Knowledge Organization by M.P. Satija Amritsar, Guru Nanak Dev University, 2004. xix+248p, price Rs. 250/- ISBN 81-7770-101-0.

Organization of knowledge helps in the proper utilization of the existing knowledge resources and facilitates creation of new knowledge. Knowledge organization and information dissemination is central to library and information work. Library and information professionals evaluate the knowledge resources to accumulate the best possible knowledge assets and organize these knowledge resources in a way which helps in their retrieval with maximum recall and greater precision. With the increasing professional attention and interest in the area of knowledge organization, this field is growing at a tremendous rate and so do its terminology. In the interest of further advancement of the field of knowledge organization, its terminology must be standardized, organized and conveniently presented for quick reference.

This work is in fact an attempt made by the author to organize and conveniently present various terms and issues in the area of knowledge organization. This dictionary not only defines terms but also provides a meaningful explanation to facilitate complete understanding of terms and concepts for users of this dictionary. The description of some terms (e.g. index language pp 103-105) is so elaborate that it gives this work the look of a concise-encyclopedic dictionary. The author has provided a brief, simple, logical and consensual meaning of terms and brief description of concepts with explanations, examples and comments in a bottom up way.

In all a total number of 670 terms are covered in this dictionary. The terms are arranged alphabetically in the word-by-word order. The terms selected and included in this reference work form the part of current vocabulary of the field of knowledge organization. This work is not lexicographical but terminological. The major concern of the author is to make it commentative readable and educative apart from being an informative reference work. The author has also tried to investigate relations between various concepts and consolidate them into a system of definitions. A number of cross-references have been given to interlink the related entries. Terms taken from other authors' works, organizations and websites have duly been acknowledged. A few illustrations are also included to explain various terms. The author should have titled this work as Glossary instead of dictionary because it more or less provides definitions and even explanations to ensure full understanding of terms to users instead of merely providing meaning of words and terms. This work will be very useful for teachers, students and practitioners in the field of knowledge organization.

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Knowledge Organization, Information Processing and Retrieval Theory by P.S.G. Kumar, New Delhi, B.R. Publishing, 2003, ix+412p, Price Rs. 1000/- ISBN.81-7646-361-2

In the growing global competition in every human activity, the competitive advantage originates more from 'knowledge' rather than capital, land or labour. Several studies corroborate the fact that knowledge management enhances innovation, responsiveness, productivity and ensure better action in every sphere of human activity. As the demand for knowledge and ideas is constantly increasing in the new knowledge driven economics, increasing attention in being paid to creation, organization, and communication of new knowledge. In the whole knowledge cycle, knowledge organization and information processing is crucial for the creation of new knowledge and proper utilization of existing knowledge.

The book under review deals with the knowledge organization aspect of the knowledge management. It has been planned and written by the author keeping in view the literature requirements of the paper-II of the UGC model curriculum for two years integrated M.Lib. I.Sc. programme. All the topics and sub-topics included in this paper have been adequately covered by the author. The information pertaining to each topic is comprehensive, presented in the logical order, lucid style and simple language, which is helpful to students in self-learning. The author has a vast teaching experience and has prepared this book keeping in view the psychology of learning, cognitive needs and convenience of learners. For instance, at the beginning of every chapter of the book a synopsis has been provided which not only provides a topical outline but also help the students to refresh their knowledge.

In all there are nineteen chapters, which have been organized into three different units. The unit-I pertains to Universe of Knowledge and includes five chapters on areas such as structure and attributes of universe of knowledge, modes of formation and types of subjects and universe of subjects as mapped in different schemes of classification. The unit-II which is titled as Methods of Knowledge Organization includes six chapters which cover areas such as need and purpose of library classification, species of library classification, normative principles of library classification, trends in classification, design of depth classification schedules and description and features of standard classification schemes namely DDC, UDC and CC. The unit-III has been captioned as Bibliographic Description which includes eight chapters covering topics such as need and purpose of catalogue, forms of catalogue, document description, standard codes of cataloguing, normative principles, trends in standardization and description, subject heading lists and subject indexing. The chapters have been presented more or less according the topics included in the M.Lib.I.Sc's integrated course for paper-II. Whatever minor changes the author has made here and there are in the interest of most convenient presentation of information. At the end of each chapter assignment for students and sources used for compilation of the chapter are given. An index is given at the end of the book, which helps to promptly locate information on various topics. This book adequately serves the purpose for which it is published. This document, which has been brought out as Kumar's curriculum series in Library and Information Science, 2, will be very useful for both faculty and students of M.Lib. I. Sc. integrated course. However, the book has been exorbitantly priced and several students may not be able to afford to buy it.

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KASHFUL ALFAZ –DEEWAN-E-GHALIB

(Mutdawil, Ghazliyat)
Compiled/edited by Jamal Abdul Wajid New Delhi, Ghalib Institute.2002.
807p. Price: Re 400.00

Concordancing in modern connotation is a science of making indexes, analyzing keywords, counting word frequencies and finding phrases and idioms and much more. It has been reinvented lately, thanks to software engineering and WWW, to serve as a tool in language teaching/learning, data mining and data clean up, translation /language engineering, corpus linguistics and natural language software development, Lexicography and content analysis in many disciplines including Accounting, History and Medieval studies. Thus web concordances are already available especially in the field of Religion and English literature. We witness concordances of Bible on the web, besides of P.B Shelley (Selected Poems) and of T.S. Coleridge and John Keats. Software for web concordance is developed by K J C Watt Known as "Concordance" acting as a powerful tool for concordancing, which means that every single (orthographic) word (i.e. a string of text separated by a space) is searched and compiled into a concordance. It is useful for East Asian texts as well. However, there is no evidence of right aligned languages/ scripts like Arabic, Persian and Urdu covered in the programme as these have their own problems of syntax and connotation of the word and its derivatives, homonym etc.

The book under review is a rare contribution of a scholar librarian in the field of Urdu literature in general and in understanding the facets of concordance of an Asian language in particular. It should not only help to meet and understand the usual and unusual needs of Urdu love sonnets of Ghalib and Classical Urdu Literature but may serve as basic tool for programmers and algorithm writers for developing a software for developing concordances in the near future. Thus it is a landmark in exploring new frontiers of knowledge and useful to a scholar investigating linguistic dimension of Urdu or Persian literature. The work has put in hard labour, besides monotonous in nature which should have been normally carried out by some organisation for about two to three yeas with at least three persons. It can't be a job of an individual, unless filled up with enthusiasm, dedication, extraordinary hold on Urdu poetry and linguistics.

Mr. Wajid commences his work with a preface and introduction, both well documented and informative. The book is spread over three parts. The first part is divided into three sections. The first section contains list of ghazals (love sonnets) in alphabetical order under 'Radeef' (i e Rhyme) & year of composition indicating ghazal number given in the book itself. It serves as an index to the collection of love sonnets

Its second section is an index in alphabetical order with first sentence of the couplet, making the first word as an entry element. This entry element or key is in bold face to distinguish it from other words. The main and last section is 'Deewnan-e- Ghalib " (F3. نسخہ عرشی) Collection of love sonnets in rhyme order] having 234 'ghazals'.

The second part contains indexes, graphs ,tables etc . The first table indicates against each radeef , number of 'ghazils' and total number of couplets. The second set of tables gives under each radeef ,list of ghazils with the full line showing 'radeef' in bold face and indicating ghazil number and its total couplets. The third set of tables under each year shows for each redeef 'ghazil ' number as per the 'deewn" and couplets thereof. The next set of tables is distribution of 'ghazils' with couplet number under each 'radeef' analysed in many tables. The last table is a time graph drawn using spreadsheet showing 'ghazils' and number of couplets and also expressing it with a percentage bar in different shading. The use of colour mechanism could have made it more contrast and beautiful on a magnified scale on A4 size paper.

The 3rd part is the main part of the book giving the dictionary description of the words used by Ghalib in his ghazils. It is divided into two sections-

one dedicated to the nouns and the other to the verbs associated with the poetry of Ghalib. The document contains description for use of the book in a well organized manner.It has excluded certain words listed separately in the book under review as a "Stop List". The homographs are taken together and where Aphesis Aphaeresis has been encountered in the dictionary, cross references are given. The nouns used are singular for Urdu and Persian words especially where "ha" (ہ) has been used for making plurals but while different mechanism is used for construction of number in Urdu language both singular as well as plural is used. Each word in the list refers to three digits in the fist line i.e. Ghazal number, couplet number and line first or second of the couplet referred to. Each digit is separated by a dot in the line. The second line of the book refers to five digits. The first digit shows frequency of the word in the content, the second digit position of composition order, the third digit percentage calculated from total occurrence, fourth digit shows its presence in number of ghazils ,while the fifth digit Indicates its percentage.

The volume is printed on a good quality paper and excellent bindings in hard covers, with text well executed having accuracy, precision and dedication to the aims and objectives of this useful dictionary. Prof Wajid is to be congratulated for a meticulous and superbly executed concordance, that deserves to be consulted by readers of Indian culture, scholars, students and libraries interested in Urdu literature especially one specializing in Ghalib studies.

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NEWSCAN

Promoting digitization

The *Library of Congress* and the *National Endowment for the Humanities* (NEH) announced on April 04, 2005 that six institutions have received more than $1.9 million in grants in the *National Digital Newspaper Program* (NDNP), a new, long-term effort to develop an Internet-based, searchable database of U.S. newspapers now the public domain. Two-year projects in *California, Florida, Kentucky, New York, Utah and Virginia* each will digitize 100,00 or more pages of each state's most historically significant newspapers published between 1900 and 1910. When completed, digitized newspapers will be made available through the Library's Web site www.loc.gov.

"Digitisation is making more museum, library and archive collections accessible across the internet. MLA and DPC are working with a range of national partners to ensure that the knowledge held in those institutions can be accessed wherever and whenever it is needed. Digitisation means that objects and information in different places can be brought together to create virtual collections, matched to the particular needs of the searcher. But a new survey shows that these digitized collections may be at significant risk of being lost of future generations if the issued of digital preservation is not addressed." Report published by Museums, Libraries and Archives Council & Digital Preservation Coalition June 16, 2005.

On April 13, 2005 JSTOR announced that it is developing a new Biological Sciences Collection that will contain the complete back-runs of at least 100 scholarly journals in the field. The collection will introduce titles in academic areas that are new to the JSTOR archive, such as cell biology and zoology, and will offer greater depth in fields now offered through the existing Ecology & Botany Collection such as biodiversity, conservation, paleontology, and plant science. To develop the collection, JSTOR has partnered with two leading organizations in biological science publishing, the Ecological Society of America (ESA) and BioOne.

JSTOR is a not-for-profit organization whose mission is to create and maintain a trusted archive of important scholarly journals while extending access to those journals as broadly as possible. The Biological Science Collection is JSTOR's 12th collection and will add more than 70 new titles to the 29 journals now available through the Ecology and Botany Collection. (Ecology & Botany will remain available as a stand alone collection; its journals will also be available immediately as a part of large periodically beginning in mid-2005 and will be completed by the end of 2007.

More details : Hilary Dunst hdunst@aol.com

The Fedora Project is proud to announce February 24, 2005 the release of version 2.0 of the Fedora open-source digital repository software. This release represents a significant increase in features and functionally over previous releases. New features include the ability to represent and query relationships among digital objects, a simple XML encoding for Fedora digital objects, enhanced ingest and export interfaces for interoperability with other repository systems, enhanced administrative features, and improved documentation. More than ever, Fedora is capable of serving as the foundation for many types of information management applications, including institutional repositories, digital libraries, records management systems, archives, and educational software

http://www.fedora.info

The Joint Information Systems Committee (JISC) announced on October 2004 that it is making grants totaling more than £1million to nine UK educational institutions and their partners to support digital preservation and asset management in UK Higher and Further Education institutions.

All UK universities and colleges face issues related to long-term management and preservation of information in digital format. Institutions increasingly invest heavily in digital materials but policies and procedures for long-term management of digital assets remain underdeveloped. JISC is

funding projects in this programme to raise awareness of digital preservation issues and encourage and set in motion a process of integrating digital preservation and asset management into institutional strategies and operations.
http://www.jisc.ac.uk/index.cfm?name=digital_pres_pr_271004

Technology Promoting Library Use

A new report published by the Central Institute of Public Finance and Accountancy on May 25, 2005 shows a record rise in public library usage across the UK. In 2003/04, visits to public libraries increased by nearly 14 million, over 250,000 extra visits a week. This is the second consecutive annual rise and builds on an additional 5 million visits made in 2002/03 – the first upturn in usage since the early 1990s. The sea change in popularity coincides with the introduction of computers and internet access into all 4200 of the UK's public libraries. Thanks to the lottery-funded People's Network project there are 32,000 computer terminals offering broadband internet access in public libraries, and all library staff have been trained to provide help and advice for users.
http://www.mla.gov.uk/news/press_article.asp?articleid=808

Public Health & Libraries

The US National Commission on Libraries and Information Science (NCLIS) in a transmittal letter addressed to President Bush, Vice-President Dick Cheney, as President of the Senate, and Speaker Dennis Hastert of the US House of Representative on May 11, 2005 has called on the US Administration to support libraries as health information distribution centers. This specific role for libraries – already successful in many communities – will position libraries as the central resource for providing citizens with consumer health information, particularly when they require health information in a critical or unusual situation, and for helping citizens learn how to live a health lifestyle. Over the course of a year, the NCLIS Health Award for Libraries initiative will identify libraries in each state with outstanding health information programs. In May 2006 a top winning library will be announced and representatives from that library will travel to Washington, D.C. to receive a $20,000 cash prize.

Training in New Competencies

All 40,000 public library staff across the UK have received ICT training and are using new skills to improve services for library users. A major new study undertaken by the Tavistock Institute and published on March 01, 2005 assesses the impact of a £20 million training programme, which has been funded as part of the People's Network, the national project to link all 4200 public libraries to the internet. The study highlights a paradigm shift for public libraries, spurred by the introduction of new technologies. It shows how the People's Network has helped open up a range of possible future scenarios for libraries and begun to shape new professional identities for library staff.
http://www.mla.gov.uk/news/press_article.asp?articleid=780

February 10, 2005 announcement from Alan Poulter, University of Strathclyde – "M.Sc. in Digital Libraries is a brand new course, starting in October 2005, which focuses on start-of-the-art research in the design and development of digital libraries. This course is intended for students who have pertinent experience of library or information work, including membership of a relevant professional body a good Undergraduate degree and/or a Masters degree in librarianship or a cognate discipline.
http://www.gsi.strath.ac.uk/.

National Resources to Support Academics

The contents of journals and other serials represent an immense and invaluable resource for researchers in all subjects. However, the task of identifying, locating and accessing these serials, hel by institutions across the UK, has up to now presented a significant challenge. The national Serials Union Catalogue (SUNCAT) was today launched on February 15, 2005 to help meet this challenge. Funded by JISC (Joint Information Systems Committee) and the RSLP (Research Support Libraries Programme) since 2003, and developed by EDINA at the University of Edinburgh in partnership with Ex Libris, the catalogue has achieved a critical mass of some 3.7m records. These are made up of records from national libraries, the largest UK academic library collections and international databases, such as the ISSN World Serials database and CONSER, the database of

MARC21 serials records available from the Library of Congress".
http://www.edina.ac.uk/suncat"

Promoting Infrastructure

On February 7, 2005 the US President's Budget requests $262,240,000 for fiscal year 2006 for the Institute of Museum and Library Services (IMLS). The request, which represents an increase of $21,565,000 in funding for IMLS core programs, includes:"

- $221,325,000 for the Library Services and Technology Act, an increase of $15,374,000 from the FY 05 appropriation for the same purposes;
- $38,915,000 for the Museum Services Act, an increase of $4,191,000 from the FY 05 appropriation for the same purposes; and
- $2,000,000 for a new grant program authorized by the African American History and Culture Act.

Earlier in December 2004 President Bush signed the 'Consolidated Appropriations Act, 2005', which provided FY 2005 appropriations for the Institute of Museum and Library Services. The bill includes an increase of 4.8 percent for IMLS programs for a total of $240,675,000. The budget also included an additional $39,889,000 for congressionally-directed grants. IMLS grants and leadership activities help to create and sustain a nation of learners, building the capacity of libraries and museums to serve their communities.
http://www.imls.gov/whatsnew/current/020705.htm

New ISBN

The new 13-digit ISBN has been approved and plans are underway to transition to the new number industry-wide, world-wide by January 1, 2007. This expansion of the ISBN from 10-digits to 13-digits will impact library business and operations:

Pertinent to add here that the idea of standard book number was conceived first in Britain for computerized warehousing of books. ISO later invited opinions from other countries on the usage of British venture and the 10 digit ISBN was approved as ISO 2108 in 1970.
http://www.niso.org/standards/resources/ISBN.html

Free UNESCO Software

UNESCO in order to facilitate and promote automation of libraries worldwide, particularly in developing countries, offers the WEBLIS, an integrated library system based on CDS/ISIS. It is a Web based Library Integrated System based on CDS/ISIS. The system has been developed by the Institute for Computer and Information Engineering (ICIE), Poland, based on their experience in building library systems for international organizations such as FAO, IFAD and GTZ. WEBLIS runs through the WWW-ISIS engine, also developed by ICIE. Soon, the free ware WWW-ISI engine will be distributed as Open Source software.
http://portal.unesco.org/ci/ev.php?