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How and Why Are Libraries Changing?

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Introduction

The purpose of this paper is to initiate discussion among a small group of university and college library directors being convened by the Digital Library Federation (DLF) and the Council on Library and Information Resources (CLIR) to explore how and why libraries and library use are changing. This exploration is envisioned as the first step in a larger initiative that includes conducting research and presenting the research results to library directors, their provosts, presidents and faculty. The ultimate goal is to facilitate understanding of how and why libraries are changing and better position the library to meet the needs and expectations of university and college administrators and library users. This paper and the published results of the research proposed here will be of interest to all academic librarians because they address significant issues and concerns that confront libraries being held accountable for the learning and research outcomes and cost-effectiveness of their efforts.

Though librarians have always collected data to support strategic planning, the rampant changes precipitated by new technologies are making traditional performance measures less effective in demonstrating the library's contribution to higher education. The first section of this paper explains the problem in detail and describes what is at stake. The second section analyzes the intrinsic limitations of traditional measures and our understanding of the trends they reveal. The third section addresses some environmental factors that may help us understand why library use is changing. The paper concludes by proposing research designed to help fill the gaps in our understanding of changes in library use.

Problem Statement

What do we know about how and why libraries are changing? We have the traditional measures that quantify a library's raw materials or potential to meet user needs ("inputs"), the work done with these raw materials ("outputs"), and fledgling efforts to assess the impact that library collections and services have on users ("outcomes"). The purpose of all inputs and outputs is to achieve outcomes, but neither inputs nor outputs indicate how well user needs are being met, the quality of library collections and services, or whether the library is accomplishing its mission within the larger institution. Traditional measures do not cover the full scope of how libraries are changing or explain why these changes are occurring.

The absence of reliable information that documents and explains shifting patterns in library operations

and use is adversely affecting strategic planning and the cases that academic library directors must make to win or bolster support for the library and its changing directions. Academic libraries cannot effectively prepare for the future or position themselves on campus until they understand their changing roles in the current learning and research environment, which is radically different from the environment a decade ago. Understanding and evaluating library usage patterns and developmental paths are prerequisites to formulating a critical and appropriate response to widespread, rapid changes in higher education.

Sources of library use data exist, but the data are incomplete and problematic. For example, the data that libraries gather are often not consistent across institutions or through time, so the value of peer-comparisons and time-series trends is dubious. Similarly, usage data from commercial vendors of electronic resources cannot be compared easily because they measure or define the data differently. Trend data indicate but do not explain why library use varies in relation to library size. Interpretation is confounded by different institutional goals and local library policies. Differences in institutional mission affect not only support for and (therefore) use of the campus library, but the library's commitment to data collection and analysis. Confronted with these difficulties and yet clamoring for some vision of what is happening, the tendency is to aggregate existing heterogeneous data to reveal trends, then interpret the normalized data cautiously because they may be misleading. Even if these complicated problems were solved, traditional library measures would still provide an incomplete picture of the information landscape because they focus strictly on information services provided by libraries, ignoring information services provided by other entities on or off campus.

Academic libraries may be gathering data because they are easy to gather or because they have always been gathered, rather than gathering data that inform clearly articulated purposes or important decisions to be made. Traditional measures of library inputs, outputs, and calculated ratios serve to rank and compare libraries along lines well-entrenched in the profession, but the data are of little value in meeting the current strategic planning and case-building needs of library administrators. What does it mean, for example, to know that X number of books was added to the collection this year, or that Y materials were circulated or Z reference questions answered? Though ratios that relate traditional output measures to the size of the campus community facilitate comparison, what good is it to know the ratio of total volumes or library staff to the student population? Are we assuming that more is always better than less? Is it necessarily bad if market penetration of interlibrary loan or reference service reaches only a small percentage of students and faculty? Is there some magic formula for allocating the appropriate percentage of a library's total budget to materials, staff, and operating expenses that will guarantee library outcomes in line with the university's mission? Ratios and percentages may be interesting indicators of local trends or progress toward local goals, but what do they really mean for the future of libraries and librarianship? Web server statistics are another case in point. The data easily gathered by Web servers may be interesting, but their meaning and application are elusive. Is the number of hits on a Web page low because the page is unnecessary or because (buried under too many links or a single, poorly labeled link) the page is difficult to find? In what context are numbers about total database sessions, Web page hits, and bytes transferred meaningful or useful?

New technologies have rendered traditional measures less effective in explaining what is happening in libraries because the scope of traditional measures is too narrow to encompass the field of change. For example, traditional measures do not capture sufficiently the readily apparent changes in the definition, preservation, and delivery of library collections. In the past a "collection" was what the library physically owned. Records in the library catalog referred to items in the collection. Libraries now license access to remote electronic collections that they do not own. The library catalog contains records with interactive URLs pointing to the licensed items and libraries frequently provide other points of access to these items on their Web site. If a print subscription is cancelled, the library retains ownership of the (previous) physical volumes. If an electronic subscription is cancelled, the library does not retain

access to the (previous) digital volumes. In the past, multiple purchasing or subscribing libraries in effect archived and preserved print publications. In the digital arena of licensed access, libraries no longer play this role, but must look to publishers to provide this service for digital collections.[1] Traditional library performance measures do not reveal these significant changes or the real concerns or serious implications that arise from them.

Concerns about the stability and longevity of digital publications discourage many institutions from valuing publications "born digital" in promotion and tenure considerations, which is a strong deterrent for faculty, though such publications are the conspicuous solution to the economic crisis in scholarly publications. This crisis and efforts to better serve our constituencies are changing the relationship between libraries, publishers, authors, and artists. Libraries become publishers when they digitize collections, host journals that are "born digital," or assemble student or faculty works online. [2] Librarians become politicians when they lobby faculty not to sign away copyright to a print publisher, who then requires them or the library to pay for use of their own works. Traditional measures do not capture these new roles.

As commercial publishers and aggregators usurp much of the work involved in collecting, organizing, and preserving (digital) information, the focus of librarians is shifting to teaching and research. Librarians are expected to facilitate skilled information retrieval (not Web "surfing"), intervene between the user and the information to help users evaluate what they retrieve, and assume greater responsibility for learning and research outcomes. Knowing that usability affects usage, librarians are also expected to do more user-centered research employing a greater variety of research methods than in the past (for example, focus groups, surveys, interviews, user protocols, card-sorting studies, and paper prototyping). Developing or providing access to digital collections and services requires librarians to collaborate with a wider range of people than in the past, including computer scientists, graphic designers, pedagogy experts, archivists, and museum curators. The core competencies required to perform these new tasks are different from those required of librarians in the traditional print environment. Again, traditional measures do not capture these new roles and responsibilities.

New technologies are also changing the services that libraries provide, for example, online reference, instruction, document delivery, user-initiated library loan, direct borrowing and self-checkout. At least one librarian sees the shift to user-initiated services as analogous to fast food, a cheapening or devaluing of what libraries provide, hence the phrase "the mcdonaldization of libraries." [3] Usage statistics and cost analyses of these services are not readily available, but even a simple change in service can have significant impact on library operations. [4] Traditional measures do not capture these changes or their implications.

The cumulative effect of these changes appears to be a reformulation of the library's mission. The freely accessible information on the Web, in consort with the escalating cost of library materials, jeopardizes the traditional mission of libraries to create and sustain large self-sufficient collections for their users. Library philosophy and practice have shifted from purchasing materials and offering services "just in case" to "just in time." The cost of access appears to be more affordable than the cost of ownership, though it comes with the accompanying risk of loss if no one purchases or preserves an item (ending the viability of interlibrary loan) or if no one archives or migrates digital collections to the inevitable new formats and platforms that the future will bring. The widespread adoption of technology and reduced barriers to access account for these trends and the speculation that the digital divide is disappearing. [5] If the access model continues to offer more information at less cost to an increasing number of people, the ownership model may disappear altogether or be reserved for only high-cost, low-use materials. What would this mean for the future of libraries and their assessments of cost-effectiveness and learning and research outcomes?

Traditional library measures indicate some differences among libraries and changes over time within

libraries but, in the absence of additional library measures, the consideration of contextual factors, and clearly articulated assumptions, offer nothing that will help us recognize which differences or changes are significant in terms of fulfilling our mission and serving our constituencies in higher education. The situation is critical. Without this knowledge, we cannot prove to university and college administrators that our efforts contribute substantially and cost-effectively to the learning and research outcomes of the institution. This fact should fuel reflection, discussion, the surfacing of assumptions, setting of strategic goals, and framing of a constellation of existing and new measures that will provide the context necessary for interpreting change and planning the future trajectory of libraries. Library directors must

1. Understand how and why libraries and library use are changing
2. Reach agreement on how to measure the learning and research outcomes and cost-effectiveness of library collections and services, which entails determining how to define and assess "value" in a hybrid world of traditional and electronic collections and face-to-face and online services
3. Plot a course into the future that is flexible enough to cope with the speed of change precipitated by information technologies and the Internet[6]

If we're not diligent, the speed of change will inhibit if not paralyze attempts to make sense of what's happening in libraries and intervene for the good of our constituencies. Admittedly, change sometimes occurs so quickly that by the time a research project is designed and implemented, and the results analyzed, the results are no longer applicable because the situation has changed. [7] We know that we cannot plan effectively for the future by projecting increased access to current technologies, but we dare not be discouraged. The future of academic libraries is at stake. We must begin now to understand how and why libraries and library use are changing if we want libraries to be positioned effectively in higher education a decade from now.

Trends in Traditional Library Performance Measures

What do we know about how and why libraries are changing? The points for discussion presented below were garnered from publicly available statistical data[8] and a telephone survey of librarians and staff being conducted by the Digital Library Federation as part of itsusage, usability, and user support initiative. They address trends and therefore do not necessarily reflect every library's experience. All that we appear to know with confidence is what trends have emerged in traditional library inputs and outputs. The trend data are indicative but not explanatory of change. They are difficult to interpret because they lack context and are rife with hidden assumptions. Nevertheless, reasonable speculation abounds to account for the trends.

Trends in Traditional Input Measures

Budgets. With rare exception, libraries are experiencing slight increases in materials budgets, educational and general operating budgets, and staff salary lines. Operating expenditures have increased significantly to meet automation and electronic resource needs, which create shifts in staffing, resources, materials, space, and equipment. [9] Current budgets are insufficient to keep pace with the skyrocketing cost of materials, the increasing burden of capital expenditures for technologies that rapidly become obsolete, and the need for retraining or recruiting and retaining staff with the skills required to use and maintain the technologies. "Experience has shown that library budgets, exclusive of capital costs and the costs of physical maintenance, which fall below 6% of the [institution's] educational and general [operating] [E&GO] expenditures are seldom able to sustain the range of library programs required by the institution," [10] but many libraries receive less than 6% of their institution's E&GO budget. Another rule of thumb for a successful library operation is that the percentage of increase in library budgets each year should equal or exceed the percentage increase of tuition and fees, yet library budgets appear to seldom reflect such increases. In some cases, libraries are not informed when new degree

programs, majors or research centers are instituted. Even when they are informed, more often than not they are expected to stretch existing budgets to support the new initiatives. Libraries have been unable to make a convincing case to university and college administrators to increase their budgets using traditional performance measures. Aside from these considerations, library expenditures do not provide administrators with a complete picture of the cost of information service provision in a networked environment. The cost of the campus network, software, and hardware in public computer clusters or laboratories; and the licensing, storage, and delivery costs of electronic information provided by other units on campus, along with the staff costs to manage these facilities, must also be considered. Libraries are competing for these campus dollars.

Collections. Most libraries are canceling serial subscriptions, purchasing fewer monographs, and-to keep pace with user demands for more desktop delivery of materials-spending a growing percentage of their materials budget on licensing access to electronic resources. The decline in acquisitions may be due to the increased cost of materials, a more effective distribution of materials through collaborative purchasing (via consortia, organizational networks and inter-institutional agreements), or a shift in users' expectations of libraries. "Just in time" information delivery may be becoming an acceptable replacement for the traditional "just in case" archival imperative. Libraries are operating with fewer volumes per student than in the past, but there is no context in which to determine if this is good or bad.

Staff. Overall staff size is slowly declining, but many library systems departments are hiring more people to maintain the increasing array of library information technologies. Clerical positions are being eliminated throughout the library and positions are being created or reclassified at higher levels (with higher salaries) because more sophisticated technical or managerial skills are needed now than in the past. Typically, new or upgraded positions are accommodated by combining open positions because salary lines are insufficient to do otherwise. The need to retrain staff to keep pace with technological change adds the burden of finding increased funding for travel and training in an already strained budget. [11] Libraries are operating with fewer staff per student than in the past, but again there is no context in which to determine if this is good or bad.

Equipment. The era of microform equipment, photocopiers, and the card catalog has been replaced with a growing array of hardware, software, and systems. Libraries need budgets and articulated replacement cycles for all of this equipment. More often than not, the capital budget is insufficient to replace equipment before it becomes obsolete. Furthermore, libraries must find the financial resources to replace equipment purchased with one-time funding from grants. Aside from the budgetary concerns, traditional measures do not help libraries with equipment planning. For example, they provide no contextual information that would facilitate calculating how many computers the library should provide for public use based on the number of students who have their own desktop or laptop computer or the number of computers available in public clusters or laboratories on campus. Lacking this information, difficult and time-consuming queuing studies may be required to determine whether the number of public computers in the library is appropriate for the user population.

Space. Following years of reducing or eliminating user and staff spaces to accommodate growing physical collections, more and more libraries are looking to offsite storage to solve their space problems and wondering how to fund offsite storage from an already strained budget. Current library standards for user, staff, and collection spaces do not consider the space occupied by technology, for example, computers, printers, scanners, and fax machines. Traditional measures have been ineffective if not irrelevant in efforts to convince university and college administrators that the Internet and digitization are not a near-term solution to the library space shortage.

Trends in Traditional and Emerging Output Measures

Materials circulated. Use of print resources is decreasing. Use of video and other media appears to be increasing. Overall circulation is declining. In-house use of library materials is also declining. Why come to the library to check out a printed book or use a printed journal when you can find an electronic version of the book or journal or something comparable or good enough on the Web? In the absence of any data about student and faculty use of information resources provided by entities other than the library, what does a decline in circulation really mean in terms of supporting education and research?

Reserve items circulated. The circulation of print reserves is declining rapidly, even in institutions that do not offer electronic reserves. In some institutions faculty are putting fewer materials on reserves. The decline in reserve items and usage may be due to the availability of full-text resources on the Web - provided by the library or by other entities. Faculty may be mounting full-text materials in course management software like BlackBoard, thereby eliminating use of the library but accomplishing the same purpose. The decline in reserve use could also simply reflect the behavior of current students. [12] In the absence of usage data on other information sources, what does a decline in the use of reserves mean for the quality of education and research? Electronic reserves are popular with students and faculty, but the added value of desktop delivery is accompanied by added costs. The cost of providing electronic reserves is significantly higher than providing print reserves because of the equipment and staff skills needed to scan, store, link, track usage, and seek copyright permission to digitize the materials.

Reference questions answered. Use of reference service has been fluctuating, but appears to have dropped significantly in the past year. Traditional face-to-face reference service with a librarian is being transformed by information technologies deployed to reach an increasingly remote audience, for example, electronic mail, "chat" and "see you, see me" videoconferencing software. Reference services provided by the library are apparently being challenged by reference (or reference-like) services provided by entities outside of the library. Why ask a reference librarian when you can Ask Jeeves, Allexperts.com, or one of the many other Ask-A services now common on the Web? In the absence of usage data from and quality assessments of these other sources, what does a decline in the number of reference questions answered in the library mean for the quality of education and research? Libraries lack sufficient contextual information to make sense of what's happening in reference service.

Interlibrary loan transactions. Use of interlibrary loan (ILL) is increasing, in many cases dramatically, probably because of cancelled journal subscriptions, the purchasing of fewer monographs, and the provision of citation databases that index materials not owned by the library. Improved service quality could also be a factor. The bottom line, however, is that we do not have the contextual information we need to understand why ILL is increasing. We do know that new technologies are transforming ILL, blurring the lines between ILL and document delivery services, and shifting costs. Increased costs for staff training, hardware, and software (like ILLIAD and ARIEL) exceed decreases in staff costs associated with photocopying and mailing, though the added value to users of patron-initiated ILL and desktop delivery and tracking no doubt improve service quality.

Library instruction classes. The number of traditional library instruction sessions and participants was increasing until recently, but now appear to be on the decline, perhaps because distance-learning technologies are being deployed to deliver library instruction. Other environmental factors that may be affecting library instruction are the increasing technological savvy of users who can transfer skills from one vendor's databases to another, or student and faculty use of information resources and services not provided by the library, in which case library instruction is not in step with user needs or behavior. Again, we lack the necessary contextual information to interpret what a decline in library instruction sessions or participants really means or why it is happening.

Gate counts. Gate counts are declining. Why go to the library if you can find the information you need using your personal computer, create an Internet chat room to discuss your group project, or use a

similar discussion facility provided in course management software like Blackboard that integrates your class syllabus, assignments, readings, quizzes, and grades? We can speculate all we want, but we lack the contextual information to interpret why gate counts are declining or what the decline means for education and research.

Electronic resource use. The demand for desktop delivery of materials is increasing. Use of electronic resources is growing more rapidly than expected. Use of older journal volumes in electronic format is increasing even more rapidly than use of electronic resources overall. [13] The problems associated with vendor statistics are well known and many organizations, including the Association of Research Libraries (ARL) and the International Coalition of Library Consortia (ICOLC), are working with vendors to create standard definitions, methods of measurement and delivery formats to facilitate comparative analyses. [14]

Printing and photocopying. The trend appears to be that the volume of printing is increasing and the volume of photocopying is decreasing, probably because of the increased availability of full-text electronic resources and printing of electronic journal articles. However, additional contextual information is needed to understand what is actually happening in any given institution. For example, in at least one library that charges for printing in an institution where printing in public computing labs is still free, printing has dropped because users seek free printing, yet photocopying has remained constant. At Carnegie Mellon, where printing is free campus wide, printing in the libraries dropped significantly this past year, particularly printing by library staff. Users may be printing more information outside of the library, but the dramatic decline in staff printing is inexplicable. Regardless of the volume of printing, more expensive printers and supplies are required now than in the past to accommodate printing color and new file formats like PDF, TIFF, GIF, and JPEG. If libraries can recover costs for printing, the new income may eventually offset the potential decrease in revenue from photocopying. [15]

Trends in Outcomes Assessment

Outcomes assessments are hampered because they rely on input and output measures that are difficult to interpret and on institutional performance objectives that frequently are only vaguely defined and perhaps even contested on campus. If university and college administrators and faculty have not clearly articulated the learning and research outcomes they expect from the library, how do libraries know what outcomes to assess in order to demonstrate their contribution to the institutional mission?

Learning and research outcomes. In response to the (vague) call for accountability for student and faculty achievements, libraries are beginning to measure the impact of their collections and services on users. The effort to date has focused on assessments of user satisfaction and service quality. The easiest and most popular measurement is a survey of user satisfaction, but this assessment alone is a "facile outcome" because it provides little if any insight into what contributes to user dissatisfaction. [16] Nevertheless, the trend in these assessments indicates that user satisfaction is a function of the individual user's perception of the quality of the library's resources, the competence and demeanor of library staff, and the physical appearance of library facilities. [17] In contrast, service quality focuses on reducing the gap between user expectations of excellent service and their perception of the service delivered. Studies of service quality assess the collective experience of many users and suggest that reliability is the most important characteristic of service quality. [18] Though these approaches to outcomes assessment are sufficiently interesting and informative to warrant continued use and development, they may be doomed to failure in terms of winning or bolstering library support from university and college administrators and faculty if the outcomes they assess are not based on proficiencies aligned with the nature and mission of the institution or integrated with the campus's overall assessment efforts.

Cost-effectiveness. Libraries appear to be stymied about how to assess the cost-effectiveness of their operations. To survive they must understand the costs associated with their collections and services. The difficulty of allocating the costs of a particular collection or service to content, staffing, facilities, hardware, and overhead is compounded by the difficulty of distinguishing between start-up costs and ongoing expenditures in an era of rapidly changing technologies, prices, and workflows. A thorough cost analysis must include purchasing or licensing costs and operational costs, such as the cost of selection, ordering, cataloging, shelving, checkout, networking, printing, associated reference questions, instruction, technical support, and maintaining related Web pages and links. Furthermore, such analyses must be repeated to keep abreast of changes. For example, a 1993 functional cost analysis of interlibrary loan indicated that staff costs accounted for 77% of the total cost of the service. [19] Given the technological changes and accompanying cost shifts in providing ILL, this analysis needs to be repeated.

Even if libraries could periodically and accurately allocate and calculate increases and decreases in costs for collections and services, the analyses would be insufficient to determine cost effectiveness. Cost effectiveness requires a clear definition of "value" to users and some way to factor this qualitative indicator into an otherwise quantitative model. For example, undergraduate students appear to value convenience and delivery speed more than the quality of the information delivered. (Confronted with this dilemma, what is the appropriate role for academic librarians? What do we do when we have a compelling reason to believe that what users want is not what they need?) Purchasing electronic resources or digitizing information adds value, but increases costs. In an environment where faculty want electronic access but are reluctant to dispense with print, [20] the additional expense of acquiring and maintaining both print and electronic collections is difficult to determine but predicted to be exorbitant and unsustainable. Libraries need to explore alternatives and conduct more cost analyses like the 1998 journal study at Wellesley College to compare the cost-effectiveness of subscribing to a title with the cost of purchasing articles from that journal on an as-needed basis. [21] To make informed decisions, such analyses must be accompanied by assessments of user satisfaction or service quality with the different alternatives. Assessments of cost effectiveness are subordinate to and must be placed in the context of outcomes assessments to take into account the value of library collections and services to users.

A study of costs associated with electronic journals conducted at Drexel University illustrates the complexity of doing cost analyses. The Drexel study reveals that providing electronic journals creates significant shifts in staffing and operational costs. While the purchasing power of an electronic-journal dollar is greater than that of a print-journal dollar (because of bundling and backfiles), providing the requisite infrastructure of hardware, software, and systems staff significantly increases operating costs. The cost of staffing increases with electronic journals, partly because library administrators must be involved in negotiating licenses, joining consortia to get better pricing, developing collection strategies, and managing change (restructuring workflow, reorganizing staff positions, and building staff with appropriate skills, including the skills needed to track usage statistics and produce meaningful reports). The cost per unit of processing electronic journals is less than print, but requires staff with computer skills and the ability to adjust to continuous change in procedures. Even if the physical journals are no longer maintained, the increased cost of system maintenance, license negotiation, printing, and reference is greater than the decreased cost in physical collection acquisition and maintenance (including check-in, claiming, circulation, re-shelving, weeding, binding, converting to microform or offsite storage). [22] The question remains, is the overall increase in costs incurred by providing electronic journals offset by the added value to users? Even if we believe that it is, how do we effectively make that case to university and college administrators so that budgets can be increased appropriately?

Difficult tasks take a significant amount of time to accomplish. Librarians and staff are already overburdened with increasing and changing responsibilities. Even if the institution has clearly defined

the outcomes it expects, many libraries do not have people with the requisite skills either to assess the teaching, research, and financial outcomes of the library's efforts or to prepare the materials required to present them effectively to university and college administrators in the limited time typically allotted to libraries to make their case. In the absence of clear guidelines and supportive models, libraries appear to be doing what is simple. For example, libraries perform simple calculations of the cost-per-search or cost-per-session of electronic resource use, based on the license cost alone, to determine whether to maintain a subscription, regardless of the fact that the calculation is misleading because it ignores the many associated costs and the user-centered qualitative dimension that ought to be the focus of any outcomes assessment. Usage is not synonymous with value.

What value do users place on library collections and services? The commercial enterprise called Questia may provide a measure of the library's dollar value to students. Questia's success depends on students being willing to pay $20-22 a month for access to 50,000 digital volumes and software tools that facilitate writing their papers. If Questia succeeds, will it help or hinder academic library efforts to illustrate their value and win support for digital library development? We don't know the answer to this question in large part because we do not really know what university and college administrators and faculty want or expect the library to contribute to the institution's mission. Administrators and faculty must clearly articulate their expectations and identify the performance indicators that they believe measure them before libraries can conduct meaningful and convincing outcomes assessments. Library inputs, outputs, and assessment efforts should be guided by what the institution says it wants. Without such guidance, libraries may fail to win support for their initiatives.

Environmental Factors

In the absence of environmental contextual data, traditional measures are difficult to interpret and explanations of why library use is changing are destined to be speculative. The larger context surrounding libraries must be examined to identify environmental factors that may be influencing the changes occurring in libraries and confounding interpretation of library trend data. The list of factors explored below is not comprehensive. It is presented to stimulate reflection and discussion. Exploration of additional factors is invited and encouraged.

Changes in Literate Habits

Research indicates that a rapidly growing percentage of the use of electronic library resources occurs outside of the library. At some institutions, the percentage approaches or exceeds 75%. Remote use of library resources means that users of unrestricted resources and services may not even be affiliated with the institution. Where once students and faculty turned to libraries, they now turn to their personal computers when they need to find information. Faculty members appreciate the convenience of the Web, but know that often the best resource is still only available in print. They know how to determine whether an information source is authoritative and timely, and generally have months or years to complete a project, so interlibrary loan and document delivery services are viable options for their research. Students, in contrast, are unable to distinguish appropriate from inappropriate resources for their assignments, have little time to complete their projects (in part because they procrastinate) and are enamored of the Web. In many cases, if the information is not available on the Web, it does not exist for them. They want a way to restrict their queries to retrieve just full-text electronic resources, regardless of whether the best material for their assignments is available only in print.

Focus group and survey research indicates that undergraduate students typically turn to popular Web search engines when they need to find information. These search engines index only the "surface Web," where less than 7% of the information is appropriate for educational or scholarly purposes. No single Web search engine indexes more than 16% of the surface Web, [23] yet we have no evidence that

students use more than one search engine when they look for information. According to BrightPlanet, the "deep Web" is 500 times larger and growing faster than the surface Web. The deep Web provides information in all disciplines, for all constituencies, that is 1,000-2,000 times better in quality than the surface Web. Approximately 95% of deep Web content is publicly accessible without fees or subscriptions, but deep Web content, like scholarly commercial resources licensed by the library, is not indexed and therefore not accessible using popular Web search engines. [24] The growing concern is that many undergraduate students may be searching only 0.03% of the Web to complete their assignments, ignoring entirely the books, journals, databases, full-text digital resources and other scholarly materials provided by the library. Because of easy access to the Web, undergraduates are using library collections and services less than in the past and, in the absence of quality information and tools on the surface, this may imperil the quality of student learning. For this reason, some faculty members do not allow their students to use Web resources in class projects.

Even if undergraduate students turn to the scholarly electronic resources licensed by libraries, their search skills are poor. They seldom if ever use advanced search features, do not understand that result sets are not necessarily organized by relevance to their query, and look only at the first Web page of ten to twenty items retrieved. Even if they come into the library, they seldom consult a reference librarian. In response, librarians are developing Web-based training materials to teach critical thinking skills and search techniques to remote or Web-enthralled users.

These are desperate times for outreach to students. Even if the Web accounts in part for the decline in library usage, other factors must be considered if we want a complete picture of the environment that constrains library use.

Changes in Students and the Curriculum

Do current students read less or have less intellectual curiosity than former students? Are they just too enamored of the surface Web or too busy to explore or learn how to explore what libraries offer? Years ago, Carnegie Mellon students had difficulty using the online catalog, but could find the books they needed on the library shelf using the Dewey Decimal System. Today, they have no difficulty using the Web-based catalog, but they cannot find the books they want on the shelf because they do not understand the classification system. They ignore the numbers to the right of the decimal point and appear to be oblivious of the alphanumeric Cutter number. [25]

Students today want 24-hour access to digital library collections and services, as evidenced by a study of the online habits of 2,000 American college students conducted by netLibrary.

- 82% of the students surveyed own a computer and "virtually all of them use the Internet."
- 93% claimed that finding information online makes more sense than going to the library.
- 83% said they were frequently unable to get the materials they need from the library because it is too late or too early to go to the library.
- 75% said they do not have enough time.
- 75% liked the convenience and 71% liked the time saved by finding information online any hour of the day. [26]

Library directors can only wonder what impact Questia will have on student use of the library. Perhaps students have (or will have) little if any need to use the library. Faculty may be assigning fewer projects that require use of library resources. Like librarians, faculty members are being held accountable for the educational impact of their efforts. Does the preparation of course packs or the use of courseware like BlackBoard that bundles all the materials students need for a course simplify faculty outcomes assessments by eliminating the independent variable of student skill in using the library? Do faculty in certificate and graduate degree programs that are designed to move students quickly through with

minimal burden on their time pre-package materials to eliminate the need to spend time using the library? What impact does the growing interest in online courses and distance education have on library use? In the absence of digital user certificates, libraries provide proxy servers for remote access to restricted electronic resources and services, but this technology is problematic, high maintenance, and may be circumvented by pre-packaging course materials.

Changes in the Technological Infrastructure

As computers become more affordable and more and more students purchase their own, what impact does this have on library use? What impact do wireless access and the growing number of student-owned laptops have on library use? Students clearly prefer desktop delivery of information and if they have a personal networked computer, in their eyes they may have no need to come to the library - hence the decline in gate counts and reduced circulation of traditional library materials. Do differences in student ownership of computers and the bandwidth of the campus computing infrastructure account for the differences in trends among large and small libraries? Is the percentage of remote use of electronic resources and services influenced by the penetration of computing and network bandwidth of the campus?

Perhaps equipment configurations and replacement cycles are also a factor in library use. Why, for example, would students come to the library to retrieve electronic resources using obsolete equipment when their own computers are faster, better equipped to handle multimedia and loaded with all of the software they need to complete their assignments? Libraries typically restrict their public workstations to information retrieval tasks only, preferring students to go elsewhere to do email, word processing, programming, etc.

Information Resources and Services Provided by Entities Outside of the Library

What impact do Ask-A services, Questia, and Web sites like LibrarySpot have on student use of their local library? We need systematic quantitative and qualitative studies of these information resources and services to understand their impact on library use and the constituencies that libraries aim to serve. If the goal is to provide quality service to users, does it matter whether libraries provide the service or someone else does? If students are using these services and their quality is poor or inconsistent, how do librarians direct them to the better services and teach them how to critique the information they retrieve? Perhaps most importantly, how do libraries factor in the impact of these services in their efforts to assess the educational outcomes of the collections and services that they provide?

Proposed Research

Librarians must lobby university and college administrators and faculty to articulate clearly what they expect the library to contribute to the institutional mission. Meanwhile, librarians must continue to develop strategic plans for the future and endeavor to win or bolster support for the library and its changing directions. To do these tasks effectively, we must understand how and why libraries and library use are changing. Traditional library measures are inadequate for this purpose. Substantial research is required.

The range of changes that libraries are experiencing is too broad for a single research study to address. The study proposed here is to conduct an exemplary quantitative analysis that will begin to explain how and why library use is changing significantly. The study is warranted because existing trend data, anecdotes, and speculation, however reasonable, are insufficient evidence for planning and case building with university and college administrators. To start filling the gaps in our current understanding, at least three tasks must be accomplished. A small, representative group of concerned and motivated library

directors need to

1. Identify and define a manageable set[27] of measures, including new environmental indicators, that can be used to document and explain how and why library use is changing
2. Recruit staff to collect and analyze genuinely comparable data about library use and influential environmental factors
3. Publish and disseminate the results of this analysis to inform strategic planning and case-building and spur discussion of the implications of changing patterns of library use for the future of libraries and librarianship

Performance measurement is admittedly a political activity. Electronic resource vendors are hesitant to share certain kinds of usage data for fear libraries will cancel subscriptions. [28] Similarly, libraries are hesitant to share certain kinds of usage data for fear their institutions will interpret the data to mean that the value or importance of libraries is declining and consequently cut their budgets. However, non-disclosure of data inhibits understanding and jeopardizes effective planning. [29] The challenge is twofold. First, stakeholders must understand how to interpret the data and the context in which it is meaningful. Second, they must trust one another. Caution and perseverance are essential to the goal of understanding how and why library use is changing. Library directors who participate in the research proposed here must be both bold and sensitive, understanding that the importance of the comparative aspect of this work and the need for trust must outweigh concerns about sharing confidential data that may reveal significant declines in library use and the striking impact of our competitors in the information marketplace.

The proposed research calls for changing or expanding traditional library measures in a new direction. Management literature offers encouraging guidance. For example, the eight-stage process for creating change outlined by John P. Kotter begins with establishing a sense of urgency (by examining competitive realities and identifying opportunities) and creating a guiding coalition to articulate the vision, plan the strategy, and lead the change. Kotter explains that encouraging agents of change is less important than identifying and removing obstacles to change-like reluctance to trust one another or to tackle the difficulty of assessing the impact of Ask-A services on library use. [30] Stephen R. Covey says that to change a situation, we first have to change ourselves. [31] Daryl R. Connor's research on change indicates that we will necessarily move from a period of "uninformed optimism to informed pessimism," but we should not be discouraged. [32] The future of libraries and librarianship and the learning and research outcomes of our institutions of higher education will be determined by what we initiate today. The question is do we have the chutzpah to pioneer the frontier that currently overwhelms us?

The Digital Library Federation and the Council on Library and Information Resources are providing the opportunity to examine the competition and create the guiding coalition. For practical reasons they have invited only a small number of libraries to participate in the proposed research, but all academic libraries are invited and encouraged to follow the group's work and to supply input and feedback that will help refine the project and interpret the results.

Notes

1. Publishers offer lip service, but have done little if anything to demonstrate their commitment to archiving and preservation or to assure libraries that the service will be affordable.

2. Conversations at conferences with vendors of digital rights management software indicate that vendors do not perceive libraries as publishers and consequently are not developing affordable software to meet library needs. Similarly, vendors of e-book devices seem to be unaware or naïve about how universities operate, believing that the campus bookstore or library is organized and prepared to load

each student's device with the textbooks and other materials needed for their courses when these become available.

3. B. Quinn, "The McDonaldization of Academic Libraries." *College and Research Libraries*, Vol. 61, 3, pp. 248-261.

4. For example, the shift to providing email notices of overdue books and enabling online renewals resulted in a significant drop in revenue from fines in Carnegie Mellon University Libraries.

5. S. Singleton and L. Mast, "How Does the Empty Glass Fill? A Modern Philosophy of the Digital Divide." *EDUCAUSE Review*. November-December 2000, pp.30-34, 36.

6. According to Raymond Kurzweil, the rate of technological progress currently doubles every decade, so a hundred years of progress at the current rate will happen in 25 years. Change itself will reach an exponential rate of growth by 2015. Kurzweil, Founder and Chief Technology Officer, Kurzweil Applied Intelligence, and Founder and Chief Executive Officer, Kurzweil Educational Systems, made this projection at the Earthware Symposium at Carnegie Mellon in October 2000.

7. For example, years ago Carnegie Mellon consulted with experts in the field and began to design a queuing study to determine whether we had enough public workstations for our users. Before the study design was even completed, we abandoned the project because more and more incoming freshmen arrived on campus with their own computers. Similarly, we considered how to stretch our already strained budget to accommodate adding network ports (a "Netbar") for the conspicuously growing number of laptop computers that students were bringing into the library. This project too was abandoned when wireless computing and affordable wireless cards rendered "Netbar" unnecessary.

8. The trends discussed in this paper are based on an examination of aggregate data from ARL and annual reports from selected Oberlin Group libraries. Aggregate Oberlin Group data is not publicly available.

9. For example, the shift from print to electronic journals dramatically changes the workload and kind of work to be done, and affects space, equipment and supply needs.

10. Standards for College Libraries of the Association of College and Research Libraries

11. EDUCAUSE recently released a report stating that insufficient funds to recruit or retain qualified information technology staff has reached crisis proportions in higher education, a crisis that requires the attention and support of university presidents and provosts to solve. See EDUCAUSE Executive Briefing. "Recruiting and Retaining Information Technology Staff in Higher Education." *EDUCAUSE Quarterly*, Vol. 23, 3, 2000, pp. 4-7.

12. A presentation at the annual American Library Association Conference a couple years ago reported on a comparative study of print and electronic reserves use. The results revealed that some students do reserve readings and some do not. The delivery media was irrelevant.

13. K.M. Guthrie. "Revitalizing Older Published Literature: Preliminary Lessons from the Use of JSTOR." March 23, 2000. Cornell University and the University of Michigan have seen similar results with the Making of America collections.

14. The licensing and associated costs of electronic resources are addressed later in this paper.

15. The equipment that enables cost recovery for networked printing is expensive, so it may take years to break even.

16. "Task Force on Academic Library Outcomes Assessment Report." Association of College and Research Libraries, June 27, 1998, p. 3.

17. S.S. Andaleeb and P.L. Simmonds. "Explaining User Satisfaction with Academic Libraries: Strategic Implications." *College and Research Libraries* 59 (March 1998), pp. 156-167.

18. D.A. Nitecki, "Assessment of Service Quality in Academic Libraries: Focus on the Applicability of SERVQUAL," *Proceedings of the 2nd Northumbria International Conference on Performance Measurement in Libraries and Information Services* (Newcastle on Tyne, England: Department of Information and Library Management, University of Northumbria at Newcastle, 1998), pp. 181-196. One of the primary thrusts of ARL's New Measures Initiative is converting the service-specific SERVQUAL instrument into a library-wide LIBQUAL instrument, which is being pilot tested at this time.

19. Referenced in C.H. Montgomery and J. Sparks, "Framework for Assessing the Impact of an Electronic Journal Collection on Library Costs and Staffing Patterns.".

20. A survey of ARL and non-ARL libraries in 1997-1998 indicated that 29% of the ARL libraries and 34% of the non-ARL libraries had canceled print journals for electronic access in the previous year, but 51% of the ARL libraries and 40% of the non-ARL libraries said that they did not and will not cancel print for electronic subscriptions because the academy is not ready to relinquish print. Referenced in C.H. Montgomery and J. Sparks, "Framework for Assessing the Impact of an Electronic Journal Collection on Library Costs and Staffing Patterns.". The 1999 survey of 214 JSTOR subscribers revealed that 64% of the institutions had no plans to discard bound volumes of JSTOR titles, 39% had moved or planned to move physical copies of JSTOR titles to offsite storage, and only 24% had stopped binding or planned to stop binding recent issues. See http://www.jstor.org/about/bvs.html.

21. Referenced in http://www.wellesley.edu/Reaccreditation/seven.html.

22. C.H. Montgomery and J. Sparks. "Framework for Assessing the Impact of an Electronic Journal Collection on Library Costs and Staffing Patterns."

23. S. Lawrence and L. Giles. "Accessibility and Distribution of Information on the Web." 1999. (See also, *Nature* 400 [1999]: 107-109.)

24. M.K. Bergman. "White Paper - The Deep Web: Surfacing Hidden Value." July 2000.

25. This observation is based on the author's experience of being interrupted in her office on the second floor of Hunt Library, which houses all the monographs in the social sciences and humanities, to help students find books they discovered using the public workstations outside her office.

26. "Yankelovich / netLibrary Study Looks at Online Habits of American College Students."

27. "A limited amount of data gathered with clear intentions is much more valuable than a vast amount of data with no specific purpose." W. Shim, C.R. McClure, J.C. Bertot et al. "ARL E-Metrics project: Developing Statistics and Performance Measures to Describe Electronic Information Services and Resources for ARL Libraries, Phase One Report." November 7, 2000, p. 55.

28. One of the librarians interviewed in the DLF survey of usage and usability assessments told a story of a vendor who called to report a large number of turn-aways trying to access their resource, presumably to get the institution to license more simultaneous users. A close examination of the usage reports indicated that the turn-aways were clustered over two days during which there were very few database sessions, suggesting that the problem was technical, not a licensing issue. Vendors also neglect

to discern logouts from time-outs in their usage reports, which librarians believe significantly skews reports of average session length.

29. See, for example, M. Kyrillidou. "Overview of Performance Measures in Higher Education and Libraries."

30. J. P. Kotter. "Why Transformation Efforts Fail." *Harvard Business Review*. March-April 1995, p. 61.

311. S. R. Covey. *The 7 Habits of Highly Effective People*. Simon & Schuster, 1990, p. 18.

32. D. R. Conner. *Managing at the Speed of Change*. Random House, Inc., 1992.

return to top >>

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