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This study describes the results of interviews with members of the American Library Association's Undergraduate Librarians Discussion Group (UGLi) on their library's use of technology. The questions focused on emerging and online technologies that have been implemented to reach the current generation of technologically confident undergraduate students. The results indicate that exploring new technologies is part of the culture of the undergraduate library. While students push for more technology, undergraduate libraries are responding by focusing on instruction, providing online services and creating physical spaces to meet the collaborative and technical needs of their patrons. Innovations include integrating online services and creating reusable learning objects for online instruction. Handheld devices to access library resources and streaming media were applications that undergraduate librarians expect to see in the future. The role of the undergraduate librarian will continue to evolve into a blended approach, combining traditional reference and instruction with technology.

Headings:

Undergraduate libraries

Libraries—Information technology

Undergraduate students

Academic libraries—Technological innovations

Academic libraries—Space utilization

THE ADOPTION OF EMERGING TECHNOLOGIES BY UNDERGRADUATE LIBRARIES

by
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Introduction

> "... as beauty is in the eye of the beholder,
> the ideal library is in the wish of its maker."
> - Carolyn Wells (Andrews, Biggs, and Seidel, 1996)

Since the advent of the personal computer in the late 1980s and the increasing prevalence of the Internet from the mid 1990's, libraries have begun offering services from online catalogues to searchable electronic indexes of magazines and journals to their patrons. According to the National Center for Educational Statistics (NCES), in 2000 94 percent of degree-granting postsecondary institutions with an academic library had access from within the library to an electronic catalog of the library's holdings. (National Center for Education Statistics [NCES], 2003) Many libraries are also implementing new Integrated Library Systems (ILS) to allow for greater flexibility in offering online services connected with the catalog and linking technological services.

Undergraduate libraries were born out of the need to create a space dedicated to the research and study needs of entering university students. Through the rise in the use of technology within libraries, their role has evolved into a center for introductory instruction on library research using the online tools of the library. Ninety-eight percent of academic libraries, according to the NCES (2003) study, offered instruction by library staff on the use of Internet resources within the library. Computer centers, writing centers, IT support and services such as wireless network access, laptop loan and chat reference have become commonplace within these institutions.

The undergraduates who will enter university life in the fall of 2004 were born in 1986. Their lives have included technology and the Internet for most of their existence. Traits of the current population of 18 to 21 year old undergraduate students include a high adaptability to using technology, exemplified through their use of the Internet and cell phones. Due to this generation's high level of comfort within the virtual world, libraries are sensing the push to offer resources and services online.

The emergence of a virtual library community does not preclude the need for the physical space. In Helen King's (2001) study of American and Australian universities regarding their assumptions of the academic library of the future, she found that a "physical space that is psychologically supportive, aesthetically pleasing and safe will be important." Brian Coutts, the Dean of Libraries at Western Kentucky University adds that "today's campus library is more than just a place to get resources. It's a destination that supports new, technology-driven teaching, learning, and research patterns, offering everything from books to digital databases to a social space for students to gather." (Albanese, 2003)

Through the exploration of these topics, the use of emerging technologies and the undergraduate library as a test bed for new technologies, the question arose "How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?" Interviews to explore this question were held in March 2004 with undergraduate librarians to discuss their library's use of technology, views on future uses as well as perceptions of the terms "emerging technologies" and "virtual community".

The results fall into three categories. The **Trends** category covers technology use and overall themes stated by a majority of the interviewed librarians. **Unique**

Applications, the second category of results, contains examples of individual applications or services that one or few libraries have currently implemented. The third section, **Future**, covers interviewed libraries speculations on new areas of technological exploration or applications that they are currently investigating for use in their library.

History of Undergraduate Libraries

> "The undergraduate library focuses on two problems that are particularly common to undergraduate – finding the materials they need, and knowing when to ask for help and having the confidence to do so."
> - (Association of College and Research Libraries [ACRL], 1987)

In the early part of the 20th century, undergraduates at doctoral-granting institutions were finding it increasingly difficult to use their university's main libraries. Undergraduates did not have access to the stacks, which therefore required them to request books based on card catalog descriptions, without having the ability to peruse them. Tight study spaces and the difficulties in navigating the overall library system also were issues. (Braden, 1970, p. 1-2) As collections grew, so did service demands by graduate students and faculty, highlighting the inadequacy of main libraries to meet undergraduate needs. (Braden, p. 2) Universities, such as the University of Chicago and Columbia University, responded by creating separate undergraduate collections, with one or two floors set aside for undergraduate use. (Braden, p. 2)

Through the success of special collections and services for undergraduates, the concept of building a separately housed undergraduate library developed. Irene Braden Hoadley wrote that the overall goal of the undergraduate library is "to simplify and centralize services to undergraduates." (Person, 1982, p. 5) Objectives of a separate institution included allowing open access to the stacks as well as housing course reserves.

Other goals include providing a smaller collection which would stretch across all disciplines and creating a center for instruction on the use of the larger collection. Further aims were to centralize and simplify the provision of services with undergraduate in mind. Finally, the space of the library should be constructed to incorporate undergraduate research and study habits, such as creating group study spaces for collaborative work. (Braden, 1970, p. 2)

The first building constructed to fit these principles was Harvard University's Lamont Library, built in 1949. Keyes Metcalf, Harvard's University Librarian from 1937 to 1955, proposed a plan to create a library that was easily accessible, provided materials in a wide range of subjects and was conveniently located. (Braden, 1970, p. 5) Metcalf felt that undergraduates could best be served from their own library. The separate library also freed the reference and other staff of the research libraries from meeting the heavy demands of undergraduates. (Engle, 1995, p. 368) "The true purpose of an undergraduate library is to serve as an introduction to a research library on a large campus." "…the undergraduate library, if it is doing its job, can function as a gateway for undergraduate students." (Hammer quoted in Person, 1982, p. 12)

The majority of undergraduate libraries were established in the 1960s, a decade when funding was plentiful, stated Judith Ann Harwood, Undergraduate Librarian at Southern Illinois University in The Journal of Academic Librarianship 1982 article titled "The Fate of the Undergraduate Library". "Other undergraduate libraries which followed the Lamont Library were self-contained units within a library system. They were of two kinds, either in separately-designed and constructed buildings, or in the central library buildings." (Harwood quoted in Person, 1982, p. 6) Lamont was followed by the

Undergraduate Library at the University of Michigan in 1957, the Undergraduate Library at the University of South Carolina in 1959, the Undergraduate Library at the University of Texas in 1959, the Undergraduate Library at Indiana University in 1961, and the Uris Library at Cornell University in 1961. (Braden, 1970, p. 5)

The result of designing buildings with resources and services aimed specifically at undergraduate needs was measurable through higher book circulation, establishment of course reserve materials, and higher building traffic. "In successful libraries, bibliographic instruction became a primary function as the service focus began to shift from place to process, from giving students a place of their own to preparing them for the process of lifelong learning." (Engle, 1995, p. 371) Along with the growth of instruction came the need for staff to provide these services as well as for the needs of undergraduate research. Sheila Laidlaw, Undergraduate Librarian at the University of Toronto asserts that "the need for a good undergraduate library whose staff is geared toward meeting the specific needs of nonspecialist undergraduates should be intensified, especially on campuses with high enrollments of both graduate and undergraduate students." (Person, 1982, p. 9)

The undergraduate library movement peaked by 1976. (Engle, 1995) Several authorities in the field declared it had reached its zenith. H.W. Wingate wrote an article questioning the role of undergraduate libraries published in College and Research Libraries in 1978. A 1982 symposium, headed by Hoadley, whose 1965 PhD dissertation was written on the establishment of the undergraduate library, called the separate undergraduate library model "a dinosaur". (Engle, 1995)

Undergraduate libraries began to close in the late 1970s. Reasons included budget cuts due to the poor economy of the time, or another department requiring the space where the library was housed. A few undergraduate libraries merged their collections with the main collection to allow students full access. Other libraries closed due to the library being primarily a dormitory library or by virtue of the entire university being focused on undergraduate education. (Harwood quoted in Person, p. 6)

Existing undergraduate libraries changed their role by expanding bibliographic instruction sessions in the 1970s and 80s. Budget pressures as well as higher expectations from undergraduates and their parents instigated these changes. At this time, some undergraduate libraries were merely gateways to the resources of the larger research library while retaining a separate physical space for the undergraduates. Some had begun integrating the teaching of technology. Due to emergence of virtual services, some merged or were absorbed into the main library system. (Engle, 1995)

The vision of the futurists of the 1970s began to take shape in the use of nascent technologies. Michael Malinconico, in his May 1992 Library Journal article titled "Information's Brave New World", states that "global, electronic computing networks are emerging that make it possible to satisfy a person's information needs without regard for where he or she is located or where the resources and services he or she needs are located." (Sapp, 2002, p. 111) The excitement over digital information led to the development of new concepts for the library. Michael Engle (1995) supports this by writing in 1995 that "a virtual library is being constructed, one that exists within and beyond the physical library."

Engle (1995) further states that "…as more texts are produced and archived in digital form, the overall balance of library holdings will inexorably shift toward the virtual environment." Jerry D. Campbell, Chief Information Officer and Dean of the University Libraries at the University of Southern California in Los Angeles, discusses this development in terms of the creation of the Information Commons. The Information Commons is a center for technology and research instruction housed within the library. "The information commons makes no distinction between the format of the information, whether it is digital or analog," says Campbell. Furthermore, "the information commons also recognizes no distinction between technical and reference information." (TerHaar, et al., p. 39)

Campbell feels that the imperative for undergraduate academic libraries at the time was "to understand what the library analog is in the web world and to be active in helping to develop that analog". (TerHaar, et al., p. 39) Key concerns include insuring that students didn't feel any lack of service when working virtually versus in person. Engle (1995) writes that "… [electronic communication] lacks some qualities that continue to be important in human relationships, particularly the complex nonverbal cues and responses that in person contact provides."

The development of online tools has allowed undergraduate libraries to expand key functions, including bibliographic instruction and the selection and evaluation of resources. "In the virtual library, the classroom, the point of use, and the library become one in a computer. The core collection which librarians select, organize, and point to exists there too" states Engle (1995). Through the development of these resources, undergraduate libraries can provide alternatives in fulfilling the mission, as set forth by

the American Library Association's (ALA) Association of College and Research Libraries (ACRL), to "provide a laboratory in which to teach students how to use a library." (ACRL, 1987)

As the virtual library expanded with the growth of the Internet, the concept of undergraduate libraries has found rebirth. According to ACRL's (1987) "The Mission of a University Undergraduate Library" there are several current areas of development within these institutions. Libraries are exploring the use of materials to support classroom teaching as well as expanding the overall bibliographic instruction program. Overlooked groups are becoming a focal point, as the needs of physically challenged or special needs students are uncovered. According to the National Center for Education Statistics in 2000, 58 percent of academic libraries had technology within the library to assist persons with disabilities. (NCES, 2003) Undergraduate libraries are also researching and integrating new technologies such as computers, video editing equipment or peripherals. Cooperative programs with other academic departments such as the writing center, counseling services or Information Technology (IT) is also becoming prevalent. (ACRL)

More changes occurred with undergraduate libraries, as the concept unfolded to include technology and extensive bibliographic instruction. Stanford University and the University of Hawaii responded by no longer offering a separate building, collection and staff dedicated to undergraduates completely. The Uris Library at Cornell University merged with another unit while maintaining a separate building, service point and collection. The University of North Carolina, University of Michigan and the Lamont Library at Harvard University have all undergone refurbishment and technological

upgrading. Entirely new, technologically-sophisticated library buildings that are not called undergraduate libraries but are used primarily by undergraduates have also been constructed, such as the Leavy Library at the University of Southern California and the Center for Library and Instructional Computer at the University of California at San Diego. (Engle, 1995, p. 378)

The future of the undergraduate library lies in its level of usefulness to the university community. This can be determined by the effectiveness and quality of the services provided to support the institution's undergraduate population. Offered services should meet the information needs of the students, faculty and staff involved with them. User studies, statistics, and other measurements should be collected and effectively used for assessment. There should be assurance that library instruction programs are available and funded adequately for the support of the curriculum. Adequate training, compensation and support for development should be available and encouraged. Libraries should ensure that the ratio of public services staff to patrons is adequate and new services should be anticipated and implemented. (ACRL UL Guidelines)

Traits of New Millennials

> "They're expecting to use [the Internet] to buy movie tickets and do everything else. They just expect that their library will offer it."
> - Interviewed Librarian

In his 2000 book Millennials Rising: The Next Generation, Neil Howe coined the term "New Millennials" to refer to the generation of college students born after 1982. (Lowery and Strauss, 2001, p. 6) This post GenX generation is sometimes referred to as GenY (Weiss, 2003) or the Echo Boomers, to refer to the progeny of the Baby Boomers. (Weiss) Howe puts forth several attributes when defining this generation. They include

strong communication within the family unit, high adaptability with technology, and a desire for convenience and customization.

Strong communication between this generation and their parents is another trait that differentiates New Millennials from GenX and other generations before them. This is technologically exemplified through the use of the cell phone. "There used to be a little more of a dose of old-fashioned wilderness, when there was what you might call a 'woods' between parents and their college-age kids." (Lowery and Strauss, 2001, p. 9) With cell phones, parents are able to see through the "woods" into every aspect of their child's life. (Lowery and Strauss, p. 9) Michael J. Weiss concurs in American Demographics by stating that "where young Boomers rebelled against their parents, today's Yers want to connect with theirs." (Weiss, 2003)

From the cell phone to the Internet, Millennials have shown themselves to be early adopters of technology. The Pew Internet and America Life Project studied approximately 2000 college students in 2001. They found that 20 percent of current college students began using computers between the ages of five and eight. By the time they were 16 to 18, all study participants had begun using computers. (Jones, 2002, p. 2) Once in college, 85 percent of students own their owned computer and 66 percent had at least two email addresses. (Jones, p. 2)

"While their parents are still prone to view the Internet and mobile phones as novelties, 21 year olds have literally grown up with them and incorporated them into all aspects of their lives" states Weiss. (Weiss, 2003) According to Telephia, a San Francisco based marketing firm, 47 percent of twenty-one year olds carry cell phones and 53 percent of these use their phones for text messaging, Internet access or sending email.

(Weiss) This age group's use of added handheld device functionality is twice the national average, showing their desire, regardless of location, to use technology to communicate with their peers. (Weiss)

Internet use for this generation is high. 86 percent of college students have gone online, compared to 59 percent of the general population. (Jones, 2002, p. 2) Seventy-four percent of college students use the Internet four or more hours per week, while 19 percent uses it 12 or more hours per week. This is compared to 62 percent of students who reported studying for classes no more than seven hours per week while 14 percent reported studying 12 or more hours per week. (Jones, p. 6)

During the Pew Internet and American Life Project study, the researchers observed the practice of multitasking in academic computer labs. Students were seen using instant messaging, word processing and web browsers concurrently. (Jones, 2002, p. 18) "So, too, will this generation mix work and social activity online and further blur boundaries between work and home, work and leisure" writes Steve Jones for the Pew study. He further conjectures that "opening and using multiple applications simultaneously will be routine, and switching between those applications will be seamless in practice". (Jones, p. 20)

Campbell states that "the web generation has an entirely different way of interacting with the world. They are comfortable on the web and multi-task in ways that I consider unusual." (TerHaar, et al., p. 39) Weiss (2003) agrees that "telecommunications, television and the Internet are so ubiquitous in their lives that they bounce seamlessly from one to another, sometimes consuming several media simultaneously." He writes that the *New* Millennials want to use technology regardless

of place. "They're jugglers who place high value on being both footloose and connected." (Weiss)

The Pew Internet and American Life Project found that 73 percent of college students say they use the Internet more than the library, while nine percent say they use the library more than the Internet for research. (Jones, 2002, p. 3) Linda TerHaar (2000), Director of the Shapiro Undergraduate Library at the University of Michigan supports this by saying that "undergraduates here and other places I've been have very little experience using a research library. They don't know what to expect, but many of them come complete with the confidence that they can find anything that they ever want to know or need on the web." (TerHaar, et al., p. 41)

According to the ACRL, first-year college students share several characteristics in relation to their use of the library. When they arrive, they do not yet have the sufficient research skills to fully take advantage of the research library's many services and resources. Also, they are often intimidated by the complexity and the size of a large university library system. Complicating matters, they are reluctant to ask for help in finding research or using the library services. (ACRL, 1987)

"During direct observations of college students' use of the Internet in a library and in campus computer labs, it was noted that the majority of students' time was not spent using the library resources online." (Jones, 2002, p. 13) Students, instead, tend to use the Internet prior to going to the library to find information. TerHaar (2000) concurs by saying that "one way [undergraduates] have changed a lot is that now they want everything to be delivered at web speed and in full text." Despite the fact that

undergraduates are adroit with technology, TerHaar feels that they need often still need to learn the skills of research. (TerHaar, et al., p. 38)

The Space of the Library

> "What is more important in a library than anything else -
> than everything else –
> is the fact that it exists."
> - Archibald MacLeish (Andrews, Biggs, and Seidel, 1996)

As greater numbers of library resources and services become available online, students are choosing to do their work outside the confines of the building. Libraries have seen downward trends in key services such as reference queries and overall circulation. Libraries have responded by assessing student needs and making adjustments to the space and services being offered. Gate counts in the last few years have been on the rise as students return to the new or renovated spaces to take advantage of the computer labs and longer hours which may span 24 hours a day, seven days a week. The fate of the library space remains in the balance as new technologies and services change the way libraries serve their patrons.

By the mid to late 1990's, technology began to make it unnecessary for students to visit the library for most of their research needs. The vast array of electronic resources available as well as online services such as chat reference, online tutorials and other methods of gaining help or education on how to do research evolved throughout the 1990s and into the 2000s. These tools, and even some of the services, are available 24 hours a day, seven days a week allowing students to access them when and where they need them, as opposed to having to conform to the hours and location provided by the library. (Shill and Tonner, 2003) Helen King (2001), in her paper titled Virtual Libraries:

Virtual Communities wrote that “advances in technology have enabled the emergence of virtual institutions which have no physical boundaries or constraints.” Libraries began to see gate counts and circulation drop as use of electronic resources rose.

In 2001, Scott Carlson wrote a ground breaking article in The Chronicle of Higher Education titled “The Deserted Library”, in which he interviewed scholars on the changing role of the library. Mark Taylor, a humanities professor at Williams College, states that the Internet has created a new type of student whose work methodology follows the lines of linked hypertext. “Eventually, you get a very different university, and my guess is, a very different library”, he says. Taylor further conjectures that libraries will become more virtual. (Carlson) Tracey Mendoza Westmoreland (2003), in her article titled “Maintaining Our Physical Spaces”, discusses these factors by noting that “the importance, or lack of importance, of the library as sense of place is still being questioned on many fronts, while technological innovation is still being touted as the replacement for our physical spaces.” (Westmoreland)

King (2001) wrote that although there is an increase in the use of electronic resources, this does not mean that the space is losing importance. Beyond access, students need the opportunity to move from digital to print seamlessly with the aid of expert assistance at the point of need. As Demas alluded in Carlson’s (2001) article, the social role of the library needs to be recognized.

Several arguments in support of the library building were raised by Alice Harrison Bahr (2000) in her article titled "Library Buildings in a Digital Age, Why Bother?”. The first, and perhaps logistically most important, point is that not everything can be digitized. Not only is it cost prohibitive, there are legal issues surrounding copyright

which prevent all materials from being put online. Technology concerns such as maintaining image quality and the reliability of electronic storage also come into play. With the rapidly changing nature of digital storage, not only are there constantly new formats, but the need to ensure access when formats are migrated to new technologies.

Further justifications for the space of the library include their new functionality in the digital age. Libraries are being used as learning centers, resource-sharing spaces, collaborative environments, and computer labs. Although King (2001) states that new libraries are only built every 25 to 50 years at a single location, renovations are more frequent. One advantage to reconstruction can be the ability to shore up aging technological infrastructure, which may allow new purposes for the space. (Bahr, 2000)

Harold Shill and Shawn Tonner (2003) in their article "Creating a Better Place" state that many universities have implemented an information literacy requirement or goal which is driving libraries to provide greater instructional services. Through a survey of libraries which had recently completed building projects, they discovered improvements in instruction lab facilities were among the most dramatic findings. Shill and Tonner additionally found that in order "to accommodate mobile computing/network access needs, academic libraries need both an extensive, high-quality telecommunications infrastructure and widespread data connectivity in public seating areas." (Shill and Tonner) Twenty-four hour computer facility access along with support staff to help students with equipment is also becoming standard.

There is a growing trend for libraries to partner with IT services to provide computing centers with high end software. This is often coupled with either IT or library instruction to help students integrate multimedia technologies into their course

assignments. (Shill and Tonner, 2003) Co-location also extends to service desks for staffing efficiencies and the inclusion of student support. (King)

Through renovation or reinvention, libraries have begun to observe the return of their users. David Richard Albanese (2003) wrote in his article "Deserted No More" that "despite some gloomy prognoses for the campus library during the 1990s Internet boom, the campus library appears to be experiencing a renaissance." Westmoreland (2003) further conjectures that circulation and gate counts are no longer adequate measures of library's actual use since they do not reflect use of electronic resources. "Despite the perception that uniformly libraries are losing patrons, many libraries are seeing increases in door count and circulation numbers, increases that seem to correlate with an increased use of electronic resources." (Westmoreland)

"Physically, the library is at the center of the campus, and it has literally changed traffic patterns on campus. It has become a real social as well as intellectual center," maintains Mary Lee Sweat, the Dean of Libraries at Loyola University in New Orleans. (Albanese, 2003) Brian Coutts, the Dean of Libraries at Western Kentucky University adds that "today's campus library is more than just a place to get resources. It's a destination that supports new, technology-driven teaching, learning, and research patterns, offering everything from books to digital databases to a social space for students to gather." (Albanese)

As described in the previous sections, undergraduate libraries have seen resurgence in activity in the last five years due to the services they offer. The current generation of undergraduates, in having grown up with technology, is comfortable using online resources. They seek a comfortable space where they can learn how to use the

tools of the library as well as study or work in a well-equipped technology environment. The question of how these libraries were finding new ways to use technology developed through the exploration of these topics. In particular, how undergraduate libraries were meeting the demands of their emerging virtual community.

Methodology

> "We're trying to think of ways that we can reach more students in a way that's more high tech than high touch."
> - Interviewed Librarian

To reach this segment of academic libraries, the libraries participating in the Undergraduate Libraries Discussion Group (UGLi) through the American Library Association was chosen as the sample to be studied. Its membership consists of "librarians and library staff from undergraduate libraries and other library facilities serving undergraduate students from across North America" (Undergraduate Librarians Discussion Group [UGLi]). UGLi currently has 23 member academic institutions, as listed in Appendix A. The membership has ebbed and flowed since the establishment of Lamont Library at Harvard in 1954 as the first library of its kind dedicated to undergraduate research.

The research question for this study asks, "How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?" A full project description can be read in Appendix B. A contact list for the target population was created by visiting the website of each UGLi member library with the goal of determining the name and email address of the Undergraduate Librarian or equivalent head of the library. The findings of this data collection were that not every member institution has a separately housed undergraduate library or a discernable library director.

The purpose of participation in UGLi, for these members, is to maintain connection to trends in undergraduate services. Alternatively, some participating libraries had several staff members in the role of library director or directors managing several libraries and not dedicated exclusively to the service of undergraduates. Through extensive searching, a list of individuals was created who were determined to be either managing an undergraduate library or in related supervisory or technical roles such as Director of Instructional Services, Director of Undergraduate Services or Director of Digital Reference.

Emails, as seen in Appendix C, were sent to at least one staff member at each participating library within UGLi holding the title of Undergraduate Librarian or holding the related title of Director of Instructional Services, Director of Undergraduate Services or Director of Digital Reference. Some recipients responded with a referral to either an alternative or additional staff member of their library for interviewing. Email commitments were received from 15 librarians at 12 member libraries. Each interview lasted for 30 minutes and covered aspects of their library's use of technology to services provided online.

Interview questions, listed in Appendix D, began by gathering a general overview of the technologies and services offered by the library, then continued in categories of tools, services and community. Whenever possible, inquiries were made about specific projects that were either highlighted on the library's website or that the interviewed librarian mentioned. This exploration was designed to elicit examples of emerging technologies that fell outside of the boundaries of the interview questions. The ultimate goal of the interviews was to gather unique examples of technology use. Additionally,

definitions of ambiguous terminology, such as “emerging technologies” and “virtual communities” was sought from the respondents as means of providing description within the research question.

The interview questions for this study may be re-used, if a study parallel to this is done in the future. Fundamentally, this study is a description of how undergraduate libraries are using technology in March, 2004. The study also describes the vision of the interviewed librarians on the future of these libraries. In reporting the results of the interviews, all interviewed librarians will be referred to as “she” or “her” regardless of gender. Confidentiality of all participants has been maintained. No individual person, university or library is mentioned by name in relation to results. All quotes from undergraduate librarians in the previous sections have been taken from sources other than the interviews for this study.

Results

> [The electronic services of the library are] “reaching out in some way to the folks that are more comfortable in their bunny slippers.”
> - Interviewed Librarian

Through the course of the interviews, certain themes emerged. The space of the physical library transpired as an important aspect, even when discussing virtual resources. The librarians interviewed often began by discussing resources available within their building. When the interview ventured into virtual services, a connection was often made back to a technology or service that had originally begun in the physical building, such as classroom instruction that was turned into an online tutorial. Another common subject was the technological future of either their own library or with

undergraduate libraries in general. The makeup of the current student population was also repeatedly discussed.

As the interviews progressed, several categories of responses emerged: Trends, Unique Applications and Future. The list of Trends is comprised of technologies or services within the scope of the study that the majority of the librarians interviewed stated their library held. Often, these technologies are used system wide, such as the online catalog or courseware. Technology used by one or a few libraries went into the list of Unique Applications. The Future section is a range of the types of technology that might be used in the future, as predicted by the interviewed librarians. As many of the librarians mentioned the software that they use by name, a list of products and websites is included in Appendix E.

By way of definition of the terms within the research question, interviewed librarians were asked their opinions on the concepts of "emerging technologies" and "virtual communities". Sections within the results report their descriptions of these expressions. "Emerging technologies" tended to elicit responses grounded in technologies currently being used within undergraduate libraries. Alternatively, the phrase "virtual community" often was met with fewer responses.

Emerging Technologies

> "We are just at the very very infant stages of how we're going to use technology. It's going to be completely different."
> - Interviewed Librarian

The Library and Information Technology Association (LITA), a division of the ALA, publishes top technology trends semi-annually. The trends are determined by technology experts, who are also members of LITA, through discussion of the top

technology issues and trends in today's libraries (The Top Trends, 2004). The top technology trends presented at the Annual ALA Conference in June 2004 were:

- Institutional Repositories
- Open Access
- Web Services
- Personal Software
- Really Simple Syndication (RSS)
- Biometrics
- E-Resource Management

Participants in this study had a tendency to define emerging technologies within the realm of the pre-existing. One interviewed librarian stated that emerging technologies for libraries are "new ways of looking at things". They are not "technologies that are necessarily bleeding edge, but exist and are finding new applications in libraries". Another interviewed librarian stated that "libraries are not early adopters, but adopters dependent on their needs".

Many participants mentioned wireless Internet access, Personal Digital Assistants (PDAs) and library applications that work with both. One interviewed librarian discussed the prospect of a "convergence between PDAs and cell phones" as a potential result of the exploration into potential definitions of the phrase "emerging technologies". "The stuff I see for [the library] is the practical hands-on stuff" the interviewed librarian said, further supporting their viewpoint.

Specific goals mentioned included the integration of technologies within libraries, such as connecting courseware with online services. Federated searching, article linking as well as advances in XML were also singled out. An interviewed librarian reinforced this by stating that "XML allows information to be repackaged in very different ways which allow people greater access". Another interviewed librarian speculated on the

potential of multimedia development. She theorized that software and hardware supporting data visualization, such as virtual reality, could be useful within the library in the future.

Virtual Community

> "Our goal is to offer the same services, the same collections, in an online format as we do in person. And the challenge is always working within the limits of the confines of current technology."
> - Interviewed Librarian

A large number of interviewed librarians conveyed the need for undergraduate libraries to "go where the students go" to meet their research needs. One interviewed librarian said that "the last thing that our users want to do is come talk to a librarian." Another interviewed librarian proposed that we often expect students to come to us. She further added that "we talk all the time about creating a virtual library so students don't have to come here but it seems like the logical next step is that if we don't want to make them come here why don't we go to them"?

An interviewed librarian said that "technology is really going to allow us, or force us, to go where people <u>are</u>. And right now, people <u>are</u> online. If they're going to be in these environments, looking at their class material, we should have a presence." She further commented that "we need to find those places where they are. That's where we need to be, either physically or electronically or both. We start to become increasingly irrelevant to them if we don't find ways to be relevant." Another interviewed librarian supported this by saying that "we can't fight students who want to do things online. We can't drag them through the books. If the same content is available, or the same quality content is available, I don't want to be hung up on the format."

Understanding how to best communicate electronically with students is a key to creating a successful virtual library community, mentioned a few interviewed librarians. One interviewed librarian supports this by declaring that "as librarians, we really get caught up in our own vernacular and our own way of thinking that this is what students need. Every day we need to be reminded that they don't understand what an online catalog is or an online periodical database. We need to be able to speak their language and understand what they want."

Trends

> "The act of moving content online has changed the way students use library services."
> - Interviewed Librarian

Each interview began with the participating librarian presenting an overview of the services provided by her library. It is important to emphasize that although these services are being offered by the undergraduate libraries, some are not unique to the particular institution. Online catalogs, electronic reserves, online databases and electronic journals are generally offered system-wide. Although some undergraduate libraries serve as the home for online tutorials and online research guides, these are also often used and created system-wide.

Throughout the course of the interviews, certain themes arose repeatedly. This section synthesizes major trends as a baseline of the current state of the use of technology in undergraduate libraries as described by the participants. These themes are as follows:

- Exploring new technologies is part of the culture of the undergraduate library.
- Students are pushing for more technology.
- Budget cuts have resulted in changes.
- Undergraduate libraries are focusing on instruction.
- Undergraduate libraries are collaborating with campus departments.
- The library space is used for more than research.

- Libraries offer reference services through email and chat reference.
- Article linking and federated searching are helping to provide materials electronically.
- Undergraduate libraries offer smaller collections.
- Students have a blurred line between leisure and work

Exploring new technologies is part of the culture of the undergraduate library.

Undergraduate libraries are serving a clientele who are used to, and expect newer technologies, supposed one interviewed librarian. "It's people that are used to newer technology, people that expect it and people that are more open to experimenting with it. Undergrad libraries tend to be a showcase environment just because they get so much foot traffic. If there's a technology or something new, you want as many people as possible to see, it's a logical place to put it."

"The culture of the undergraduate library is to explore new technologies and new methodologies," stated one interviewed librarian. "As a result of being a test bed for technology, staff who want to experiment with new ideas are drawn to the environment." Another interviewed librarian supported this by stating that they are "seen as the main place providing library services for undergraduates [and therefore] are a good place to showcase new technologies."

Students are pushing for more technology.

With every entering class, academic librarians are finding that their students are more technologically savvy. One interviewed librarian stated that "generally by the time they ask a question, they've already tried resources on their own and now need specialized help." Undergraduate libraries have responded by establishing information commons and other types of multimedia labs within their buildings. Another library's information commons holds 250 workstations and includes a technology classroom.

Their multimedia equipment includes scanners, smart card readers, video digitizing tools, plotters and both color and black and white printers.

Other trends in electronic offerings not exclusive to undergraduate libraries include electronic books, or e-books, which allow many students to access the same material online at any time. Also, services such as online book renewal and equipment reservation are becoming more common. An interviewed librarian in the study stated that "we have pushed so much of our library content online that [the students] don't physically have to come in the door." The librarian continued by speculating that "there is not the need [for students] to be in the domain of the physical library and librarian." Consistent with the discussion in the **Virtual Community** section, the librarian said that the electronic services of the library are "reaching out in some way to the folks that are more comfortable in their bunny slippers."

Libraries are also finding that providing resources such as laptops available for check-out which give students portable access to the materials available online. Other equipment becoming more widely offered through library loan includes video and digital cameras, audio recorders and removable storage devices such as ZIP® drives and CD burners.

Budget cuts have resulted in changes.

A trend affecting libraries system-wide, but indicative of the current state of undergraduate libraries, is dealing with budget cuts due to limited funding through the state or other governmental institutions. This has resulted in limited hiring and staff reduction to work with new technologies or existing staff working longer hours. One interviewed librarian said that her undergraduate library is "undergoing a

transformation". Due to tight budgets and lack of staff, they are merging service points with another library. Another interviewed librarian stated that they've had to cut reference staff, which has resulted in fewer reference desk hours available for their patrons.

A third interviewed librarian's university has put wireless deployment for the campus on hold due to reduced funding from their state government. As the undergraduate library goes through budget cuts, they are searching for more ways to meet students' needs without adding staff. "We're trying to think of ways that we can reach more students in a way that's more high tech than high touch" said another interviewed librarian.

Undergraduate libraries are focusing on instruction.

Introductory research education is a primary function of many undergraduate libraries. One interviewed librarian stated that the undergraduate library is designed to meet the information needs of the undergraduates. Another interviewed librarian said that "the library is moving away from being a place that provides traditional library services to one that is supporting the student's learning process". She further predict that within five years undergraduate libraries will be called student learning centers.

Several interviewed librarians stated that the buzz phrase of information literacy has been incorporated into the goals of many universities. This encompasses not only basic electronic research instruction, but also incorporation of multimedia technologies into coursework. "There's a synthesis between [technology and online resources] in how they work for helping students learn about doing academic research," said one interviewed librarian. This synthesis is commonly occurring not only through instruction,

but also through library outreach to faculty to encourage them to incorporate technology and electronic research methods into their course materials.

Many undergraduate libraries house Instructional Services teams. These groups include dedicated staff teaching sessions on how to find materials, critical evaluation of sources and general use of the services of the library. There is also a strong trend to construct classrooms equipped with technology within undergraduate libraries. These wired classrooms are used for instruction and sometimes serve double duty as computer labs when instruction is not taking place.

One interviewed librarian stated that "the undergraduate library is driven by the patrons… They're better than [librarians] with technology but they don't know anything about research. We know about research and try to bring them along and figure out how to keep them happy with technology". Another interviewed librarian concurred that they're "so struck by the level of inquiry. It may start out just being a 'how do I get this stupid button to work' kind of question, but then of course that for [librarians] is an entrée into questions that deal more with content".

Undergraduate libraries are collaborating with campus departments.

University IT departments are now often working together with library staff to jointly provide services and support. As a greater amount of materials are being accessed electronically, the line between research support and technology support has become blurred. Some undergraduate libraries are staffing their desks with a combination of librarians and IT support staff in order to more easily meet students' needs in one location. IT departments are often also managing the computer labs housed within undergraduate libraries.

Other examples of shared space within undergraduate libraries are the co-housing of writing centers, career centers and academic advising. The presence of these departments within the space of the undergraduate library allows easy access to undergraduate services in a location created for their use. A secondary benefit is the potential of collaboration between the library and these centers for joint instruction covering both departments.

The library space is used for more than research.

Not only are undergraduate libraries taking on a greater role in teaching undergraduates how to do introductory research, they are an undergraduate social center. Often, the undergraduate library is the place where new students are socialized in how to interact within their environment. "People may not realize it, but when they come through our doors, they're learning as much about [the university] as they are [about research]" said one interviewed librarian. The library is a finite space to develop a sense of community within the greater university, especially on a larger campus.

The undergraduate library building is often multi-use, sharing space with IT, writing centers, and other departments that are not affiliated with the library. They become associated with the undergraduate library due to their co-location. One interviewed librarian stated that her library has academic community based programs such as exhibits, musical programs and ballroom dancing. "It is an active, lively space." Another interviewed librarian said that they don't see a drop in density in the way students occupy the space; however, there is a shift in demands. Renovation projects commonly include increasing multimedia services, group study space and allowing space for the incorporation of additional departments.

References to Ernest Hemingway's "A Clean Well-lighted Place" arose several times during interviews. One interviewed librarian said that students are looking for a space that is "clean, well-lighted, well wired and a place where they can study in groups…. A lot of what brings people into a space can have to do with technology and oftentimes has nothing to do with it." Another interviewed librarian surmised that the undergraduates "don't care as much about the books as comfortable couches and wireless access".

The proliferation of laptops and the addition of wireless to the building have not reduced the use of the computer labs in undergraduate libraries. One interviewed librarian hasn't seen any decrease in traffic to the library with the advent of electronic services. In fact, their reference figures are growing each year. This librarian could see the space of the library changing to be more flexibly furnished to provide spaces for all types of studying. "The technology is a huge draw. There will be lines for computers almost every week night." Another interviewed librarian further stated that "students want to use the machines that are the sleekest and the fastest".

Libraries offer reference services through email and chat reference.

"Ask a Librarian" services began with the advent of email and have migrated to online chat reference services through a variety of different providers. Some academic institutions are offering these services through a system-wide partnership, trading the staffing between libraries. Some are offering chat reference through their individual library and others are using neighboring universities as a consortium to provide increased hours.

Email reference is generally available 24 hours a day, seven days a week, although questions are only answered during normal reference hours. Chat reference hours, conversely, typically mirror the hours of the physical reference desk. Often the librarian at the reference desk is the same person offering chat reference, while some libraries have begun to dedicate staff to this service as use has increased. One interviewed librarian suggested that "we need to think of it as if we are staffing another desk. We need to take a look at how we're staffing physical desks and reduce it so we can increase staffing in the virtual environments."

Undergraduates prefer to use chat reference over email. It is immediate and available during the hours they're looking for help, said one interviewed librarian. Another added that "we have people who are ordinarily using these technologies for other things. They're expecting to use this service to buy movie tickets and do everything else and they just expect that their library will offer it." A third interviewed librarian added that "in a lot of ways technology provides us far more opportunities to teach them that did not exist before."

Some students use chat reference within the physical library because they don't want to give up their desk or need to ask an additional question. An interviewed librarian said that very often, the students using chat reference are sitting across the room. "They want to be around library things and think in a space that's conducive for that kind of thought." Another interviewed librarian agreed by saying that "it's just easier for them if they're already working online, why should they get up to ask a question when they can just sit there and do it?"

Article linking and federated searching are helping to provide materials electronically.

Less common, but becoming increasingly prevalent are services such as article linking, which allows users to find full-text versions of desired articles in alternate databases to the one in which they are currently searching. Federated searching is also growing in deployment. It allows users to meta-search through many of the university-subscribed databases at one time. Both of these, discussed in the **Unique Applications** section, provide simpler solutions to the current electronic research process and easier access to full-text electronic materials.

With the advent of Google, students expect a single search bar that federated searching might offer them, stated an interviewed librarian. "Article linking provides the full text wherever possible that students are also coming to expect. Because of the Internet, students want everything to be in one place" she further contended. Another interviewed librarian mentioned Google's ability to search publishers' databases through a trial partnership with the Online Computer Library Center (OCLC). (DeJohn, 2003) Her library would like to offer a single search box much like Google's offering. Another interviewed librarian said that article linking "is potentially great and takes the undergraduate library in the direction they'd like to go. At this point, it can add one more layer of complexity". Ultimately, she would like seamless instant access to all full text articles in all of their research databases.

Undergraduate libraries offer smaller collections.

"There's currently a big argument about not only which books to keep in the library, but whether or not to have books," stated one interviewed librarian. She believes that the undergraduate library needs a course-driven collection with a tight weeding and

collection development policy. Another interviewed librarian stated that her library has "eliminated the serials collection as the main clientele want electronic access and the collection duplicated what was available in print." Her library reduced their volumes focusing only on the highest circulation material. They also reduced their circulation period to two weeks and do not allow interlibrary loan. Conversely, another interviewed librarian speculated that "if all the books are sent away, it sends a message that books are irrelevant".

Undergraduate libraries also often serve the needs of the academic community through offering video/DVD collections and browsing collections of new fiction. One librarian interviewed referred to her library as the "public library for the campus."

Students have a blurred line between leisure and work

Undergraduate libraries, in serving not only an academic but also a social function, provide a space for students to work in a manner that is more comfortable to them. One interviewed librarian stated that "the undergraduate library is … a more laid-back, casual place for undergraduate students to come where they can start their undergraduate research projects or just hang out. It's a little bit noisier here. You see the occasional pizza box."

Technology plays a part in blurring the line between leisure and work. An interviewed librarian contended that undergraduates "are using those tools to socialize *and* collaborate on their work. That distinction is very very fuzzy." Another librarian, in sketching a picture of how undergraduates multi-task, described their work style within the library:

> "Our normal student walks up to some piece of technology. They might have brought it themselves, they might have checked it out or it may be

> something that we have plugged into a wall. They sit down. They have their cell phone sitting next to them. They may be listening to an MP3 player. Or they may be plugged into the computer, or whatever device it is, listening to some kind of music. They probably have chat going. They probably have Google open. They probably have email open. And they're doing some type of work through Blackboard or something like that. And they *may* be doing a library thing. They could have five things going and that's not invalid. That's the environment in which they actually operate and that doesn't mean they're not working either. I'm not sure the lines are always there between leisure and work for a student in today's environment."

Unique Applications

> "The technology is a huge draw. There will be lines for computers almost every night of the week."
> - Interviewed Librarian

In exploring the research question of "How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?", an image materialized. The **Trends** section discussed the baseline characteristics of the majority of undergraduate libraries in the study. It was difficult, in many cases, to discern which of these services were unique to the individual undergraduate library as opposed to being offered system wide. This section presents individual occurrences of technology used to reach the library's virtual community. In most cases, these were described by one or very few of the librarians interviewed. Many of these are offered system wide, but have originated or have been piloted through the undergraduate library:

- Online services are being integrated.
- Universities are requiring laptops.
- Libraries are hiring dedicated staff for online services.
- Electronic Reserves are being provided through streaming media.
- AOL Instant Messenger is being used for chat reference.
- Wireless technology allows libraries to take their services on the road.
- Co-browsing provides a further level of online interaction with chat reference.
- A specialized search interface helps students navigate the film collection.
- Library services are being promoted online.
- Digital elements can be used and re-used in online instruction.

Online services are being integrated.

In an effort to maximize use and usefulness of online tools, some libraries are attempting to make connections between core systems. One existing example is the integration of chat reference system link into the library web pages and into the catalog. This allows researchers to establish a chat reference session while searching without having to back out and find the link. One interviewed librarian brought forth that their library "has done a good job in making their [chat reference] service easy to find. There is a button for digital reference at the top of every library page". Other potential implementations are discussed in the **Future** section.

Universities are requiring laptops.

Although only one interviewed institution had a requirement that all entering students arrive with a laptop, many schools stated that most students brought either a desktop or portable computer to school with them. Given the number of library resources available online, a laptop in particular seems to encourage students to access services outside of the physical library and especially in academic settings such as in class.

Libraries are hiring dedicated staff for online services.

Many of the electronic services being offered by undergraduate libraries begin as side projects of current staff. A few of the interviewed libraries have begun to establish positions with the sole mission of developing and promoting a particular online offering. Titles for these positions include Digital Reference Service Coordinator, Instructional Projects Librarian, and Information Integration Librarian.

Electronic Reserves are being provided through streaming media.

One interviewed librarian offered that her library streams audio of digitally-taped lectures through their electronic reserves system. Other schools mentioned goals of

providing streaming audio or video content through their electronic reserves systems, which is discussed further in the **Future** section.

AOL Instant Messenger is being used for chat reference.

A few undergraduate libraries are using AOL Instant Messenger (AIM) instead of traditional chat reference software such as DocuTek or QuestionPoint. AIM doesn't offer the same functions, such as emailing a transcript post session or co-browsing. However, according to the Pew Internet and American Life Project, 74 percent of teenagers with Internet access use instant messaging (Lenhart, Rainie, and Lewis, 2001). The barrier to entry for most students is reduced when they can use AIM for communicating with the library.

One interviewed librarian discussed tapping into a virtual community that was already there by using AIM for chat reference. "It's so much easier to fall into place with the things that people are already excited about and using as opposed to trying to force new technology use," she said. Another interviewed librarian proposed that "if you and I were to take a stroll through any reference area in any academic library in North America, we would probably encounter about 15 to 20 percent of the students that are working there doing chat sessions." They chose to use AIM as "it was recognition that it is the way students communicate today. It goes to the different learning styles and certainly it goes to different expectations that they have".

Wireless technology allows libraries to take their services on the road.

As discussed in the **Trends** section, many undergraduate libraries have laptop and wireless network card loaner programs which allow students to research online wherever wireless network access is available. At one undergraduate library, their loaner program

is so popular that their university IT services has expanded it by opening remote laptop lending pods in other locations on campus.

Another university, in an effort to promote the use of portable technology and the online resources available through the library, has created a method of providing access to classrooms. A rolling cart with laptops and a wireless router can be lent to any requesting professor. By plugging the wireless router into a single network connection and equipping students with wireless laptops, any classroom can instantly be turned into a wired learning environment. This is not only a valuable resource for any type of academic online activity, but also allows librarians to deliver instruction in the students' classroom, as opposed to booking up electronic classrooms in the library.

Co-browsing provides a further level of online interaction with chat reference.

All undergraduate libraries interviewed provided some method of virtual reference either by email or chat. A few, dependent upon the type of software that they used, extended this service through offering co-browsing. This allows the librarian to take over the shared desktop between herself and the student and to show them on screen where to find the information for which they are searching.

One of the interviewed librarians said that a very small percentage of students using chat reference took advantage of co-browsing. The interviewed librarian supposed that this could be due to many causes. One is knowledge by the students that the additional service exists as they must download an applet to use it. A second is the level of comfort that the reference librarian has in using the technology. In systems where chat reference is shared by many librarians, a single librarian may only provide the chat reference service for a few hours each month, which doesn't allow them the familiarity to

feel comfortable with higher level functionality such as co-browsing. Therefore, they might not advertise this service to students during a chat session. A third possible issue, mentioned by the interviewed librarian, is the network bandwidth available at the student's end of the service. As the function of co-browsing takes a great deal of bandwidth, it could slow down interaction dependent on connection speeds.

A specialized search interface helps students navigate the film collection.

One undergraduate library has created an interface to search their film collection that more closely mirrors that of a commercial vendor. Although it is pulling information from the main online library catalog, it allows students to search films by genre, show recent acquisitions or link up to film reviews. The interviewed librarian said that it is an example of something developed completely in-house to meet the needs of the undergraduate community who were asking for better methods of finding movies other than the catalog.

Library services are being promoted online.

Not all online interaction is purely serious. One library created an online forum where students can post questions to the reference staff. The interviewed librarian said it started out as a physical bulletin board where students could fill out a form to ask a question and put it in a mailbox. The reference staff then posted the answer on the board. Now they do it electronically. It's generally trivial information. It's fun for the students and it lets the reference staff highlight the collection through the answers. It has been well received by both students and staff and serves as an online form of promotion for the services of the library.

Another library has created a weblog, or blog as they're commonly known. The staff of the undergraduate library posts information about new online databases, services offered by the library, and occasional fun links pertaining to the interests of the undergraduate community. Benefits of the blog include having the most recent post listed at the top and all posts are archived for later referral. Plans are underway to develop categories of information and potential methods for students to post feedback.

Digital elements can be used and re-used in online instruction.

Reusable learning objects are digital elements that can be used in combination as part of a lesson plan, online tutorial or other electronic instruction. One interviewed librarian discussed her library's effort to create reusable learning objects that faculty can take and make their own by embedding them into their syllabi or course pages. "It allows the instruction to happen for the student when they need it." Her undergraduate library has a strong endeavor to move to a blended instruction approach combining classroom hours with online tutorials.

"The combination of online tutorials and digital reference means the students really can do a lot of things at a place where they're comfortable, they don't have to come in, if they are in the library… they want someone to help them in the middle of their search rather than later trying to explain to somebody what you were trying to do" continued the interviewed librarian. The effort was born from the triumph of their instruction program. "We're becoming victims of our success. So, the next phase is to try to move it more into the virtual. Put a lot of time into creating a tutorial but then have it be able to be used multiple times without our having to touch it that much."

Future

> "Americans continue to have a love affair with their libraries, but they have difficulty figuring out where libraries fit in the new digital world."
> - (Benton Foundation quoted in Sapp, 2002, p. 205)

"The old model of libraries being passive repositories of information is obsolete. It doesn't work. We'll disappear really quickly if we stick with that model," stated one interviewed librarian. Another interviewed librarian feels that "the undergraduate library sees trends and behavior patterns before anybody else." It's important, however, contended another interviewed librarian, to see the role of technology put into context of the whole library experience. With all the services that libraries offer, the sole focus isn't on technology. There are so many other resources that this librarian wants to be sure that undergraduate libraries are always looking at the bigger picture.

The librarians interviewed for this study were asked to speculate, based on their experience, what the future might hold for emerging technologies in undergraduate libraries. They proposed the following possibilities. Many current applications of these concepts were discussed in the **Trends** or **Unique Applications** sections. Most speculation on future technologies and concepts were strongly grounded in activities that are currently being used. These potential applications fell into the following premises:

- Handheld wireless devices will allow easy access to library services.
- Streaming media will provide online access to audio and visual material.
- Customized information could be viewed through personalized web portals.
- Online tools integration will help interlink library services.
- Students can tour the library online.
- Google will be used to teach evaluation skills.
- Librarians will provide services through a blend of technology and instruction.

Handheld wireless devices will allow easy access to library services.

There were several mentions of the use of Personal Digital Assistants (PDAs) or cell phones as the potential main sources of data for students in the future. One

application might be the ability to send text messages to the circulation or reference desk if problems arise in locating materials or further information is desired. Interviewed librarians were generally skeptical about the reality of PDAs coming into use. "Potentially, we should tap into using PDAs, but undergraduates at our university don't use them a great deal. Cell phone technology might be something that libraries would like to use," stated one interviewed librarian. Another concurred that "in the library world there seems to be a trend for PDAs and having library applications that work on PDAs. I'm not real convinced of that."

Streaming media will provide online access to audio and visual material.

One librarian interviewed said that her school uses streaming audio to post digitally recorded lectures as described in the **Unique Applications** section. Expanded features of this technology could include streaming for audio or video materials. Another potential use of this technology is the ability to offer streaming media from the library's servers, much as e-books are currently available. By providing films or audio tapes online, students would have the ability to access them through their personal computers at any location, at any time they wish. One interviewed librarian would like to see more audio and video streaming instead of physical DVDs. She would especially like the libraries to be able to stream to classrooms without a faculty member having to come to the library and check out media. It would allow more than one person to view something at the same time.

One issue with streaming content is the bandwidth required by the offering institution as well as all the way through to the requesting party. Students wishing to stream media would either need to be on the high speed campus network or at a location

offering high bandwidth. This may not be effective with current dial-up or some wireless systems. An interviewed librarian, however, feels that "when we look ahead over three, four, five years, we ask ourselves, 'how much are we trying to cope with the present application of technology', which because of legal restrictions is not as great as it could be. Our capability has run way past issues of compliance and the things that rights holders care about. There's no reason in the world why we shouldn't be running everything broadband."

Customized information could be viewed through personalized web portals.

New ILS systems are being implemented and allow for greater ability to offer online services connected with the catalog. "If you look at the way most people are actually getting information from the library, how well your website is designed and how easy it is to use is really your most important thing. That's really where most people touch us now and that's what we really need to look at" stated an interviewed librarian. A personalized portal might include services to alert patrons when materials are due, online renewal, hold requests, or the ability to download catalog searches for later use. A portal might also be used to page books electronically from one library to another for more convenient pickup.

Online tools integration will help interlink library services.

Although several schools have elements of this in production as described in the **Unique Applications** section, continued integration between university systems seems to hold the greatest potential for increasing value and use of existing tools. Examples include incorporating online tutorials and e-reserves with courseware such as WebCT or

Blackboard, or the integration between ILS information such as book due dates with student or university portals.

At one library, an ILS manufacturer is working with a courseware manufacturer to develop a closer integration between the two products. The interviewed librarian stated that she would also like to see the integration of the two products with the e-reserves system. A tertiary possibility is to place links to the chat reference system in the online courseware package, with a link on each class page. However, the interviewed librarian stated that "it's not easy to implement as it has to be added course page by course page." The hope of the interviewed librarian is that through the integration of library resources into courseware, the undergraduate library will be rewarded with positive results in regards to information literacy.

Students can tour the library online.

Libraries are finding it necessary to create online finding aids of the physical library for students to access independently or to be referred to during a chat reference session. In response to student confusion when navigating different libraries within their system, one library is investigating the use of spatial mapping software called NearSpace. This software would link up with the online catalog to display a graphical map of the location of the desired print resource. The interviewed librarian felt that once NearSpace is installed, students could download a map to find their materials onto their PDA or cell phone.

Google will be used to teach evaluation skills.

Helping students critically evaluate results found through Google searches is one example of creative instruction. As one interviewed librarian stated, librarians "put so

much focus on getting students out from Google and moving them away from Google and beyond Google. I was just thinking we have to offer some more instruction, more courses, more workshops on Googling well and really learning how to use this in a way that's efficient and still applying critical thinking and evaluation skills." She further added that "if this is what they want to do, let's help them do it better."

Librarians will provide services through a blend of technology and instruction.

The need for professionals who understand them and can instruct students in their use is central to their implementation. According to ACRL ("Effective Collaboration"), blended instruction combines classroom instruction and reusable learning objects linked into courseware that is modular, user friendly, and include self assessment. ("Effective Collaboration") One interviewed librarian described this as "having collection and organization skills, plus technical and instructional design skills. [Blended instruction is about] mixing the worlds of information management and technology." (ACRL, "Effective Collaboration")

An interviewed librarian stated that there is a strong push in her undergraduate library for all of the staff to become much more web literate. Another interviewed librarian "sees a shifting role of librarians as becoming mentors in information literacy skills." A third interviewed librarian added that "we should no longer silo ourselves with what content level we're comfortable with and what we're not. There should be a base level of knowledge of online resources with which all system librarians are comfortable."

Discussion

> "Help people the way they want to be helped, not the way we think they should be."
> - Interviewed Librarian

Through the exploration of the research question "How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?" three themes were persistent. First, undergraduate libraries, due to their heavy foot traffic of technologically savvy 18-to-21 year olds, are natural test beds for new technologies and methodologies. Second, a growing focus of the undergraduate library is instruction, particularly incorporating the use of technology and online methods such as reusable learning objects. Third, undergraduate librarians are trying to bring services outside of the physical walls of the library by going where the undergraduates naturally dwell. In some cases this might be in the classroom, in the student center, in their dormitory or in their virtual world.

In constructing the research question, the intended outcome was to gather unique examples of the use of emerging technologies within undergraduate libraries. Through observation of a single undergraduate library over a two year period, evidence surfaced that pointed to undergraduate libraries as institutions of innovation due to their core population of technologically comfortable 18-to-21 year olds. Through analyzing the responses from the participating librarians, results show that the use of emerging technologies is happening not uniquely within the undergraduate library, but within the entire library system.

The **Trends** section paints a picture of the state of technology use and culture in undergraduate libraries today. The 2004 population of 18-to-21 year olds are pushing for

more technology as a result of having grown up with it. These figures stated in the **Traits of New Millennials** section, combined with supporting statements of interviewed librarians in their observations of undergraduates within the library, add up to a technologically able generation of current college students. Students of this generation also tend to blur the lines of work and social time with technology and in the library. Students are using library resources, such as computer labs, and library space to do their work, meet their friends, and communicate electronically with others who aren't in the library

Undergraduate libraries are fairly new to the academic library world, in having been established in the late 1950's. Through the changes in academic culture, generational changes, economic changes and changes in technology, undergraduate libraries have gained, lost, and re-gained acceptance in this community over the last 45 years. As many interviewed librarians remarked, they play a key role in providing instruction on research skills to entering students, an atmosphere conducive to studying, collaborating and learning, as well as providing facilities such as computer labs, wireless Internet access, and group study spaces.

The literature of the past few years, in particular Scott Carlson's 2001 article in The Chronicle of Higher Education titled "The Deserted Library", points to dropping gate counts. Many of the libraries interviewed conveyed that, with the advent of technology, their gate counts are rising and they're not seeing any drops in circulation. The interviewed librarians stated that the online resources, by virtue of inhabiting the space of the library and drawing students in, are a gateway to opening up the door to "offline" resources and services. Carlson's trend seems to be a temporary anomaly, at least as

described by the librarians in this study. Students are discovering that they still require library services such as reference or instruction to do their research, not to mention a clean well-lighted space conducive to study.

Undergraduate libraries prove to be a test bed through their innovative practices in meeting students' needs. Examples are described in the **Unique Applications** section. The most successful applications seem to be ones that are customized to student uses or use technologies that they are already using. These include AIM for chat reference, specialized interfaces for searching such as the film search interface described in **Unique Applications**, promoting services online through blogs, and the growing creation of reusable learning objects. All of these examples exemplify the undergraduate library's aim of meeting students' needs through building on existing applications.

In recognizing that the undergraduate library serves the population that is pushing libraries to use more technology, library systems could be well served by taking advantage of this predefined usability lab. Services within the undergraduate library could be expanded to make greater use of observing undergraduate habits within the spaces of the library and in their technology use. Undergraduate libraries could become the natural test lab for new technologies. The role of instructional center could expand to include testing and usability center, which seems to fit well within the exploratory concept of the library.

What this means for the profession of librarianship, however, is that we need to focus on becoming conversant in the technologies that undergraduates are using. The concept of becoming "blended librarians" needs to be embraced within undergraduate libraries. This can be accomplished through internal training, encouragement of staff to

try new technologies, and sharing ideas both within the library system, but also with other undergraduate libraries. The UGLi group currently meets and shares innovations twice annually at the ALA conference. The idea for this paper was founded at one of these round tables.

When discussing emerging technologies, most technologies were grounded in presently implemented applications. Few interviewed librarians advocated technologies from other environments. If our call to action is to go where the students go, it is important to be observant of where they are. Fairly simple (and free) applications, such as using AIM for chat reference or implementing a blog come from outside the world of library science. To understand where students are, in the virtual world, librarians need to explore outside of the library.

None of the top technologies announced at the June 2004 ALA conference was mentioned specifically by the interviewed librarians, and only one librarian referred to the top technology trends by name. Some of the concepts of the top trends, however, were brought up. Web services, for example, incorporate the use of creating personal portals, as mentioned in the **Future** section. Streaming media falls within the area of e-resource management.

PDAs were often brought up in discussion as an example of an emerging technology that libraries are exploring. Anecdotally, in the author's observation at a single institution, few students use PDAs. Many more are apt to be using cell phones, as supported in Weiss' 2003 article about the patterns of 21 year olds. A few interviewed librarians stated their agreement that as a handheld device, cell phones seemed prevalent. The message to take from this is that as librarians, we need to understand that students

rapidly adapt, upgrade and change their use of technology. In order to provide access to library services incorporating technologies that students use, we need to move faster.

The integration of existing technologies is already beginning through implementations of federated searching and article linking, which connect disparate subscription databases together for easier searching. Full text articles from online sources are also easier to find through these sources. Methods that make resources more accessible to students, who are comfortable using online resources, will help make the research process easier. Other technologies which fall into this are include the development of online instruction tools, especially ones that are engaging and easy to navigate.

Virtual communities were a blurry subject for most interviewed librarians to discuss. It seems to be an area that is just beginning to be recognized through the success of the online catalog, online research guides, online tutorials and the interactivity of chat reference. The majority of library services are currently one way with the information being posted by the library and used by the patrons. Chat reference begins to tap into the potential of interactivity and the synergy that can be created through opening the door to virtual communication and the creation of a virtual library community. Howard Rheingold (2000) wrote in Virtual Communities, "the web of human relationships that can grow along with the [online community] is where the potential for cultural and political change can be found." (Rheingold).

Libraries are using emerging technologies as detailed in the interview results, but for the most part there is currently no virtual community. The exceptions are the finite communications established during chat reference and through dyadic interchange in

online forums such as the online bulletin board established by an individual undergraduate library discussed in the **Unique Applications** section. The potential for online community is great within an institution that not only is rapidly implementing resources and services online, but also serves a population that is comfortable within the virtual world.

In assessing the research question and the results, there are other methods of focusing the study which may have resulted in responses regarding emerging technologies and virtual communities. The interviewed librarians tended to generalize from the undergraduate library to the entire university library system. It was difficult to differentiate which tools or services were being developed or provided specifically by the undergraduate library, as opposed to the system. This is a testament to the level of collaboration occurring at these institutions in that the respondents were unable to confine their responses to their particular institution. A suggestion for further research would be to expand the question to "How are academic libraries using emerging technologies to meet undergraduate research needs?" thus covering the entire system with a focus on the technological use of the current generation.

Another area that surfaced during the course of the interviews was the Library and Technology Association's (LITA) Top Technology Trends, which are announced bi-annually. The LITA committee which creates this list is made up of industry experts working in the field of library technology. To focus on emerging technologies, further research might include a quantitative study of academic librarians' perceptions of the validity of these trends, as well as whether or not they are implementing these technologies. Comparisons of the time of the announcement of the trends combined with

time to deployment within libraries could result in a sense of how quickly libraries are adapting to new technologies.

The result of this study is an understanding that undergraduates have a high affinity with technology. In creating a space for testing new technologies, undergraduate libraries are attempting to bridge the gap between the research needs of the entering students and the level of adoption by the library system. Furthermore, through the changing role of undergraduate libraries as learning institutions, this level of adaptation is exemplified in virtual tools which are easily accessible by this technologically-savvy generation.

Conclusion

> "To remain viable entities on American campuses, libraries must shun the old model of passive repositories."
> - Interviewed Librarian

The concept and purpose of the undergraduate library has gone on a rollercoaster ride within the academic community. Its role seems to best fit within a large university multi-library system with a mixture of undergraduate and graduate students. By creating a place that meets the collaborative, multi-tasking needs of the undergraduate community, as well as providing instruction and technological resources, the role has been reinvented in the last five to ten years. Innovations such as the information commons, and introduction of chat reference and online resources have been the result.

Despite college students' high use of online materials, the space of the undergraduate library continues to fulfill a purpose. Group study spaces, computer labs and instructional resources all lend themselves to the needs of this population. Many undergraduate libraries, in recognizing undergraduate study habits, are renovating their

spaces to provide resources in these areas. The undergraduate library, in its provision of a space that meets these needs, has seen resurgence in gate counts and has found a rebirth in purpose.

Through interviews of undergraduate librarians to discover how their libraries are using emerging technologies to reach their virtual community, several categories of responses surfaced. Current trends in technologies and services, unique applications by individual undergraduate libraries and a vision of the future of emerging technologies established themselves. In further definition of terms within the research question, interviewed librarians also responded with their understanding of the terms “emerging technologies” and “virtual community”.

Students push undergraduate libraries to offer more technology through their lifelong level of comfort with the virtual world. Undergraduate libraries are meeting these challenges by offering greater levels of both classroom and online instruction, providing reference services online and experimenting with the integration of services through article linking and federated searching. Through offering smaller, broad, subject-based collections and concentrating efforts on space through comfortable couches and group study areas, services through wireless network access, and facilities through longer hours, undergraduate libraries are attempting fill the gap.

Individual undergraduate libraries are establishing themselves as a test bed for new technologies through experimentation with new applications. Many of these are offshoots from existing systems or services. They include further integration of technologies such as providing a link to chat reference within the online catalog or putting audio files of lectures into the electronic course reserves.

In answering the research question “How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?”, interviewed librarians responded with developments based on current implementations. Descriptions of experimentation tended towards trying new methods of successful services, such as using AIM for chat reference. The future direction for undergraduate libraries lies in further developing their role into a true test bed and usability lab for technologies, without losing core traditional functions such as providing study space, reference services and print resources. To meet these goals, the role of undergraduate librarian will evolve into a blended role, combining librarianship, instruction and an understanding of how to use the tools of the New Millennials. Through this evolution, the academic library system will benefit from the innovation of the institution, while providing a space meeting the research needs of undergraduates,

Appendix A:
The Undergraduate Librarians Discussion Group (UGLi)

American Library Association's Undergraduate Librarians Discussion Group (UGLi)
http://www.lib.utexas.edu/ugli/

> "The **U**nder**G**raduate **Li**brarians Discussion Group (**UGLi**) was formed to discuss issues relating to the provision of library services to undergraduate students. The group consists of librarians and library staff from undergraduate libraries and other library facilities serving undergraduate students from across North America. Participation is open to all librarians and library staff interested in the provision of library services to undergraduate students and related issues."
> - (About UGLi)

Columbia University
Philip L. Milstein Family College Library
http://www.columbia.edu/cu/libraries/indiv/under/
New York, NY

Cornell University
Uris Library
http://campusgw.library.cornell.edu/library/libraries/urislib.html
Ithaca, NY

George Mason University
Johnson Center Library
http://library.gmu.edu/libinfo/jcl.html
Fairfax, VA

Harvard University
Lamont, Harvard College Library
http://hcl.harvard.edu/lamont/
Cambridge, MA

Indiana University-Bloomington
Undergraduate Library Services
http://www.libraries.iub.edu/index.php?pageId=310
Bloomington, Indiana

Purdue University
John W. Hicks Undergraduate Library
http://www.lib.purdue.edu/ugrl/
West Lafayette, IN

Southern Illinois University at Carbondale
Undergraduate Library Division (in Morris)
http://www.lib.siu.edu/hp/divisions/ug/
Carbondale, IL

Stanford University
Meyer Library
http://www-sul.stanford.edu/depts/meyer/
Stanford, CA

State University of New York at Buffalo
Oscar A. Silverman Undergraduate Library
http://ublib.buffalo.edu/libraries/units/ugl/
Buffalo NY

University of Arizona
Integrated Learning Center
http://www.library.arizona.edu/
Tucson, AZ

University of California at Berkeley
Moffitt Undergraduate Library
http://www.lib.berkeley.edu/doemoff/
Berkeley, CA

University of California at Los Angeles
College Library
http://www.library.ucla.edu/libraries/college/
Los Angeles, CA

University of California at San Diego
Center for Library and Instructional Computing Services (CLICS)
http://clics.ucsd.edu/
La Jolla, CA

University of Chicago
Harper Library
http://www.lib.uchicago.edu/e/harper/
Chicago, IL

University of Illinois at Urbana-Champaign
Undergraduate Library
http://www.library.uiuc.edu/ugl/
Urbana, IL

University of Michigan
Shapiro Undergraduate Library
http://www.lib.umich.edu/ugl/
Ann Arbor, MI

University of North Carolina at Chapel Hill
R. B. House Undergraduate Library
http://www.lib.unc.edu/house/
Chapel Hill, NC

University of Southern California
Thomas and Dorothy Leavey Library
http://www.usc.edu/isd/locations/undergrad/leavey/
Los Angeles, CA

University of Texas at Austin
Undergraduate Library
http://www.lib.utexas.edu/Libs/UGL/
Austin, Texas

University of Virginia
Clemons Library
http://www.lib.virginia.edu/clemons/home.html
Charlottesville, VA

University of Washington
Odegaard Undergraduate Library
http://www.lib.washington.edu/Ougl/
Seattle, WA

University of Wisconsin – Madison
Helen C. White College Library
http://college.library.wisc.edu/
Madison, WI

Wayne State University
David Adamany Undergraduate Library
http://www.lib.wayne.edu/geninfo/units/ugl.php
Detroit, MI

Appendix B:
Institutional Review Board (IRB) Project Description

1. Project Description.

Include (a) Purpose, hypotheses, or research questions
Research Question: How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?

(b) Procedures. Statement should include sufficient background and detail to evaluate issues of merit and risk to participants.
Study participants will be asked to participate in a telephone or in-person interview to last no longer than one hour. Participants may add further information beyond the scope of the attached interview questions where applicable as time allows.

The goal of the interview is to collect specific examples of the use of technology by undergraduate libraries to meet the research needs of their patrons outside of the physical library.

Time period: Participants will be interviewed during the month of March 2004. The majority of participants will be interviewed between the hours of 8am and 5pm. Alternate hours may be arranged if the participant is unavailable during this time.

Possible pool of participants: Public and private Doctoral granting institutions, as categorized by the Carnegie Foundation classification of institutions of higher education will encompass the pool of participants. Only institutions that have a separate library involved with undergraduate services will be included.

2. Participants

(a) Age, sex, and approximate number
Participants in the study will be both male and female over the age of 18. The number of participants will be dependent upon how many volunteer their availability during the study time period.

(b) Inclusion/exclusion criteria
One librarian will be selected to participate from each undergraduate library. Subsequent librarians from individual undergraduate libraries will be included if suggested by a participant.

(c) Method of recruiting
Participants will be solicited via:

1. An email sent to the members of the American Library Association (ALA) Undergraduate Librarians (UGLi) email discussion list describing the study and requesting participation. Attached is a list of the librarians who will be contacted from the current member undergraduate libraries.

2. Referrals from participating librarians solicited through email described above.

(d) Inducement of participation
There will be no inducement to participate in the study.

3. **Are participants at risk?**
Participants will be at no risk during the study.

4. **Describe steps to minimize risk (if 3. is answered yes).**
Participants will be at no risk during the study. Interviewer will take every precaution to ensure that participants are not harmed through in person or telephone interviews.

5. **Are illegal activities involved? If so, describe.**
There will be no illegal activities involved in the study.

6. **Is deception involved? If so, describe.**
There will be no deception involved in the study.

7. **What are the anticipated benefits to participants and/or society?**
(Optional unless **3.** is answered yes)
Participants will be offered a final copy of the study results that will detail how fellow undergraduate libraries are using technology to meet the needs of their virtual community. They may use this report to gain information on products or services which they could implement in their institution. They may also gain a sense of where their library stands in relation to peer institutions within the scope of the study.

Beyond the participants, the results of this study may benefit the greater academic library community. Although participation in the study is restricted to librarians working in undergraduate libraries, the results may be generalized to any academic library working with a virtual community of patrons.

8. **How will prior consent be obtained?**
(Attach consent forms/consent statements to be used.)
A consent form is attached that will be mailed to and signed by all participants who agree to be interviewed as part of the study.

9. **Describe security procedures for privacy and confidentiality.**
The principal investigator will conduct all interviews for the study and will keep all materials in her possession. Once the study is completed and the final report compiled, notes and materials from the study will be kept by the principal investigator and not shared any further without the participants' permission.

Results will be reported at a university level, protecting the privacy of the individual participants.

THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

Student Research Projecct
School of Information and Library Science
Phone# (919) 962-8366
Fax# (919) 962-8071

The University of North Carolina at Chapel Hill
CB# 3360, 100 Manning Hall
Chapel Hill, N.C. 27599-3360
info@ils.unc.edu

I'd like to invite you to be part of a research study entitled "How are undergraduate libraries using emerging technologies to meet the research needs of their virtual community?"

Purpose:
The purpose of this study is to gather examples of the use of emerging technologies in undergraduate libraries for documentation and analysis in my Master's paper, as part of a graduation requirement at the School for Information and Library Sciences at the University of North Carolina at Chapel Hill.

Through gathering this information, I hope to gain insight on technology trends in undergraduate libraries, as well as to find examples of creative uses of reaching the library's virtual community.

What Will Happen During the Study:
As part of the study, you will agree to be interviewed one time by telephone for approximately 30 to 45 minutes during the month of March. Once you agree to be interviewed, a time will be scheduled by email.

As a participant, you have been chosen due to your membership as a librarian in the American Library Association's Undergraduate Librarians' Discussion Group and/or as a librarian in a Doctoral Granting institution, as categorized by the Carnegie Foundation classification of institutions of higher education, which has a separate library involved with undergraduate services. Approximately ten librarians, dependent on the number who volunteer, will be interviewed.

Questions cover the scope of the use of technology in your library, as well as exploring your opinions on emerging technologies and virtual communities. The interview will be semi-structured allowing opportunities for you to provide additional information as it pertains to the subject.

The interview will be digitally audiotaped for later referral in compiling the results. You may be asked follow up questions via email once the interview has been completed. Results will be reported for the group of respondents as a whole. No individual participant's names will be included.

As the principal investigator, I will conduct all interviews for the study and will keep all materials in my possession. Once the study is complete and the final report compiled, notes and materials from the study will be kept by me and not shared any further without your permission. The digital audio files from taping the interviews will be kept on my personal laptop and only listened to by me for referral while compiling the results for my Master's paper. Once the Master's paper is completed and accepted, the audio files will be deleted from my laptop.

If you have any questions or concerns about being in this study, please contact Jean Ferguson at (919) 593-1291 or fergusje@email.unc.edu or my advisor Professor Jeff Pomerantz at (919) 962-8064 or pomerantz@unc.edu.

Your Rights:
Participation in this study is voluntary. You may skip any specific questions you choose without stating a reason. You have the right to request that I turn off the tape recorder at any time during the interview. If a follow-up question is requested by email, you may choose to not respond or not answer the follow-up question. You will not be treated any differently if you decide not to be in the study. If you decide to be in the study, you will have the right to stop being in the study at any time.

Institutional Review Board Approval:
The Academic Affairs Institutional Review Board (AA-IRB) at The University of North Carolina at Chapel Hill has approved this study. If you have any concerns about your rights as a participant in this study, you may contact the AA-IRB at (919) 962-7761 or at aa-irb@unc.edu.

I have had the chance to ask any questions I have about this study, and they have been answered for me. I have read the information in this consent form, and I agree to be in the study. There are two copies of this form. I will keep one copy and return the other to the investigator.

_____ _____

(Signature of Participant) (Date)

Appendix C:
Email Soliciting Study Participants

Dear [NAME INSERTED]:
My name is Jean Ferguson and I am a second year Library Science graduate student at the School for Information and Library Science (SILS) at the University of North Carolina at Chapel Hill.

I've spent the last two years working at the Undergraduate Library at UNC and have become interested in how technologies are used to reach our virtual community. As a result, I'm using this subject for my Master's paper.

At ALA Mid-Winter in January, I sat in on the Undergraduate Librarians Discussion Group and was excited about the wealth of experience. As an Undergraduate Librarian [OR APPROPRIATE TITLE], I'd like the opportunity to interview you for my paper and to learn about your library's technology applications.

As a contributor, you will receive a final copy of the Master's paper that will include the results and analysis of the study.

If you are willing to take part in this study, please contact me at fergusje@email.unc.edu.

Thank you for your time,
Jean Ferguson

Appendix D:
Interview Questionnaire

1. What services does your undergraduate library provide?
   [Computer access, printing, film access, computer/media editing labs]
2. What sorts of services does your library offer for students who are outside of the library (the virtual community)?
3. What types of technology would you categorize as emerging?

Tools: Computers

4. What types of technology are available to students in the library?
5. What types of technology does your school require students to have?
   [Computers, laptops, …]

Tools: Networking/Wireless

6. What types of infrastructure does your campus provide to allow students to gain access to library services? [Campus wide Ethernet, wireless, …]
7. Does your campus have wireless Internet access?
8. If yes, is this available everywhere on campus?
9. Please elaborate on the examples you provided to the above questions.

Library Services: Research

10. What types of online research does your school offer to students?
    [Databases, ejournals, …]
11. How are the students able to access library services outside of the library?

Library Services: Reference

12. What methods does your library offer for students to get reference help remotely?
    [Phone, email, chat reference, …]
13. Describe the services you offer?
14. What type(s) of chat reference is most popular? Why?
15. What was most recently added?
16. Why was the decision made to offer these services?

Library Services: Community

17. What type of online community services does your library offer?
    [Weblog, web page, online communication board, …]
18. How are these services used? Why were they implemented?

19. Are there technologies that we have not discussed that your library is using? Or other technologies that you wish you were using? Why?
20. Are there other libraries that are doing interesting things with technology to reach their virtual community? Could I contact them?

Appendix E:
Technology Discussed by Interviewed Librarians

Courseware
WebCT - http://www.webct.com/
BlackBoard - http://www.blackboard.com/

Chat reference
DocuTek - http://www.docutek.com/
LSSI / Tutor.com - http://www.tutor.com/
QuestionPoint - http://www.questionpoint.org/
24/7 - http://www.247ref.org/
AOL Instant Messenger - http://www.aim.com/
Human Click - http://www.humanclick.com/

Proxy
EZproxy - http://www.usefulutilities.com/

Spatial Mapping
NearSpace - http://www.nearspace.com/

Article Linking
SFX - http://www.exlibrisgroup.com/sfx.htm
SerialsSolutions - http://www.serialssolutions.com/
TDnet - http://www.tdnet.com/

Federated Searching
ENCompass - http://encompass.endinfosys.com/

Electronic Books
netLibrary - http://www.netlibrary.com/
Safari - http://safaribooksonline.com/

Citation Creation/Storage
NoodleBib - http://www.noodletools.com
RefWorks - http://www.refworks.com/
EndNote - http://www.endnote.com/
WriteNote - http://www.writenote.com/

Bibliography

Albanese, A. R. (2003). Deserted no more. *Library Journal*, 128, 34-36. Retrieved from Library Literature and Information Science database.

Andrews, R., Biggs, M. & Seidel, M. (Eds.). (1996). *The Columbia World of Quotations.* New York: Columbia University Press. Retrieved April 5, 2004 from http://www.bartleby.com/66/

Association of College and Research Libraries. (n.d.). Effective collaboration for campus-wide information literacy: the blended librarian's perspective on how to make it work. Retrieved April 3, 2004, from http://www.ala.org/ala/acrl/acrlproftools/collaboration.htm

Association of College and Research Libraries. (1987). The mission of a university undergraduate library: model statement. Retrieved June 25, 2004 from http://www.ala.org/ala/acrl/acrlstandards/missionuniversity.htm

Bahr, A. H. (2000). Library buildings in a digital age, why bother? defending new library buildings and additions to college administrators and trustees. *College & Research Libraries News*, 61, 590-591, 608. Retrieved April 17, 2004 from Library Literature and Information Science database.

Braden, I. A. (1970). *The undergraduate library*. Chicago: American Library Association.

Carlson, S. (2001, November 16). The deserted library. *The Chronicle of Higher Education*, 48, p. A35.

DeJohn, B. (2003, September 22). Google and the MINITEX region! Message posted to MINITEX E-NEWS, archived at http://www.minitex.umn.edu/publications/enews/special09-03.pdf

Engle, M. O. (1995). Forty-five years after Lamont: the university undergraduate library in the 1990's. *Library Trends*, 44, 368-386.

Howe, N., & Strauss, B. (2000). *Millennials rising : the next great generation.* New York: Vintage Books.

Jones, S. (2002). The Internet goes to college: how students are living in the future with today's technology. Retrieved January 5, 2004 from Pew Internet & American Life Project Web site, http://www.pewinternet.org/reports/

King, H. (2000). The academic library in the 21st century - what need for a physical place?." *Virtual Libraries: Virtual Communities. Abstracts, Fulltext Documents and PowerPoint Presentations of Papers and Demos Given at the International Association of Technological University Libraries*, Retrieved February 12, 2004 from ERIC database.

Lenhart, A., Rainie, L. & Lewis, O. (2001). Teenage life online: the rise of the instant-message generation and the Internet's impact on friendships and family relationships. Retrieved June 30, 2004 from Pew Internet & American Life Project Web site, http://www.pewinternet.org/reports/

Lowery, J. W. & Strauss, W. (2001). The millennials come to campus: John Wesley Lowery talks with William Strauss. *About Campus*, 6, 6-12.

National Center for Education Statistics. (2003). *Academic libraries: 2000 E.D. tabs*. Retrieved June 25, 2004 from http://nces.ed.gov/pubs2004/2004317.PDF

Person, R., (Ed.). (1982). University undergraduate libraries: nearly existing or continuing examples of evolution? *The Journal of Academic Librarianship*, 8, 4-13.

Rheingold, H. (2000). *Virtual Communities* (chap. 9), Retrieved July 14, 2004 from http://www.rheingold.com/vc/book/9.html

Sapp, G. (2002). A *brief history of the future of libraries: an annotated bibliography*. Lanham, MD: Scarecrow Press.

Shill, H. B., & Tonner, S. (2003). Creating a better place: physical improvements in academic libraries, 1995-2002. *College & Research Libraries*, 64, 431-466. Retrieved April 17, 2004, from Library Literature & Information Science database.

TerHaar, L. K., Campbell, J. D., Stoffle, C., Stroyan, S., Lombardi, J., Kaufman, P., & Pape, S. (2000). The fate of the undergraduate library. *Library Journal*, 125, 38-41. Retrieved March 11, 2004 from ERIC database.

The top trends. (2004). Retrieved July 3, 2004, from http://www.ala.org/ala/lita/litaresources/toptechtrends/annual2004.htm.

Undergraduate Librarians Discussion Group. (n.d.). About UGLi. retrieved January 5, 2004, from http://www.lib.utexas.edu/ugli/about.html.

Weiss, M. J. (2003). To be about to be. *American Demographics*, 29, 29-36.

Westmoreland, T. M. (2003). Maintaining our physical spaces: advocating the library as a sense of place. *Texas Library Journal*, 79, 138-142. Retrieved April 17, 2004, from Library Literature and Information Science database