I. Introduction and Definitions
With the emergence of digital reference services, defined by the symposium organizers as “human intermediation services over the Internet,” attention has naturally been focused on the education needed by those individuals who are to provide such services. What knowledge, skills, and values will digital reference librarians need? How can these best be taught? What are the educational needs of novices (students enrolled in library and information science (LIS) programs) vs. experienced providers of “traditional” reference services? To indicate the needed scope of investigation of “Education for Digital Reference Services”, it is helpful to begin with an elaboration of the component terms.

**Education.** Although discussion of education may naturally focus on preparation provided by the first professional (master’s) degree, Hauptman (1989) reminds us that education for reference services actually encompasses five types of activity: 1) formal sequence of courses as part of the master’s degree; 2) on-the-job training; 3) continuing education (conferences, seminars, workshops, professional association programs, formal university courses, professional reading); 4) evaluation (self, peer, supervisor); and 5) acquisition of substantive, multi-disciplinary knowledge. On-the-job training includes both the orientation to an organization at the beginning of employment and the ongoing learning that comes with the experience of doing reference work and consultation with more experienced reference librarians. Continuing education can come from a variety of providers, which may result in a lack of coordination or logical sequencing of content.

**Reference services.** While the focus of discussion of reference services is often on question answering, it is important to recognize the full scope of activities that can be undertaken by reference librarians. Katz’s (1969, p. 35) classification of “direct” and “indirect” reference is helpful in this regard. Direct reference is a person-to-person relationship, usually one in which the librarian answers a patron’s question or provides instruction. Indirect reference consists of behind-the-scenes activities: preparation and development of catalogs, bibliographies, and all other reference aids which help in providing access to the library’s collection; selection and organization of reference materials; evaluation of the reference collection and reference services; and interlibrary loan. Such activities no longer need be centered on a physical library. For example, Heilig (2001) notes that services provided by Jones e-global library include bibliographic instruction, research assistance, a core collection of research materials, access to electronic databases, reference assistance, and document delivery management.

**Digital reference services.** Arms (2000, p. 2) defines a digital library as “a managed collection of information with associated services, where the information is stored in digital formats and accessible over a network.” He observes that “by intelligently combining searching and browsing, motivated users can usually find the information they seek” [emphasis added] (p. 223). Digital reference services seek to enhance the ability of users to locate needed information through the work of reference librarians providing both direct and indirect services. While one aspect of digital reference services involves assisting users in accessing digital library resources, digital reference services encompass any reference services provided over the Internet and can involve use of print as well as digital resources.

Digital reference allows individuals to submit questions to library staff using synchronous (real-time) or asynchronous technology. Because the transaction takes place
through written communication (e.g., often text chat or e-mail), it is possible to record questions and answers and store them in a searchable database (“knowledgebase”). Library web pages and “weblogographies” are new forms of delivery for the products of indirect reference service. Collaborative digital reference involves multiple institutions and requires additional software support in order to route questions to the most appropriate participant. QuestionPoint (http://www.questionpoint.org), a joint service of OCLC and the Library of Congress, is an example of such a service.

The remaining sections of this paper explore the topic of education for digital reference services by providing: a brief history of education for reference services, results of a survey of reference instructors in the U.S. and Canada, a case study of the education provided to students in my Web-based courses at the University of Illinois at Urbana-Champaign, a discussion of the issues and challenges that need to be addressed, and recommendations on how to make progress in this area.

II. History of Education for Reference Services

“The functions of the librarian have always been to select the material that his constituents will require; to catalog it so that those who would use it can know what is available and where it is kept; and to preserve it so that both contemporary readers and those who will follow will be able to use it. With the opening of libraries to a wider public, another task fell to the librarian, that of helping the patron to choose the library materials most appropriate to his needs.” (Lemer, 1998, p. 211)

Reference service has been a recognized aspect of library work for only about 125 years. Green’s (1876) paper on “Personal Relations Between Librarians and Readers” is often cited as an early statement of the scope of reference work. Rothstein (1955) provides more details on the development of reference services in different types of libraries. The computer is of course not the first technology to affect the provision of reference services. Ryan (1996) notes that a consideration of three technologies to which librarians have had to adapt—mail, the teletype, and the telephone—was useful to the designers of reference service for the Internet Public Library (IPL) Reference Division.

Databases—accessed online, on CD-ROM, and now via the Internet—have been a part of reference services for more than thirty years. Tenopir and Ennis (2002) remark on the changing role of these resources over the past ten years. They suggest that expectations of both reference staff members and patrons changed profoundly during the last decade, as both groups came to believe that information related to almost every question can be found if the right combination of resources and search strategies is chosen.

Education for reference services has likewise evolved over more than 100 years. Library schools throughout the U.S. have treated reference work as one of the core courses in their curricula since 1890, when the New York State Library School at Albany offered an advanced, senior course entitled “Reference Work” (Richardson, 1992). The original courses emphasized what would now be termed “ready reference”. The generally prevailing method which library schools have employed in teaching the basic reference course has been to present the special characteristics of a number of reference books in a
number of fields and to assign questions which would test the ability of students in their
solution. This procedure has depended largely upon memory of facts about specific
reference books and the ability to use the reference collection in answering questions.
Sixty years ago Boyd (1943) noted the limitations of this approach:
emphasis on the formal reference book useful in answering the ready reference type of
questions gives undue importance to ready reference service at the expense of other types
of service.

By the 1960s coverage of the basic reference course included: a description of the
nature and kinds of reference service as a library function; study of a core set of reference
materials arranged according to types (encyclopedias, dictionaries, biographical sources,
etc.); study of reference techniques with emphasis on search strategy and the reference
interview; and selection and evaluation of reference materials (Rothstein, 1983). Summers
(1982) reported additional changes in the 1970s: 1) a major shift away from a focus on
specific tools to a broader focus involving search strategies and a much wider context of
information service; 2) a much greater emphasis upon the technological aspects of
reference, especially computerized databases; and 3) an increased emphasis upon the
behavioral aspects of information seeking and the processes of human communication. He
expressed concern that “education for reference service in library schools lags somewhat
behind the practice of reference service in libraries” (Summers, 1982, p. 167). Treatment
of technology has been uneven: while the use of computerized databases has received
considerable attention, the use of the telephone for reference service has received little
attention from library schools (Yates, 1986). This despite the fact that the use of the
telephone is not identical to good face-to-face reference work, due to the lack of visual
exchange.

Harter and Fenichel (1982) report the results of a survey of educational practices in the
teaching of online searching in LIS schools. They identified three educational patterns:
single online course, large component, integrated approach (into all general reference and
subject bibliography courses). While many instructors felt integration was the ideal, most
had a separate course. Reasons given included lack of adequately trained faculty. While
learning a system’s (e.g., Dialog) command language was part of such a course, many other
types of knowledge were covered. Topics included: file loading practices and their effect
on retrieval; the effects of specificity, exhaustivity, stoplists, and other indexing practices
on retrieval; Boolean logic; ability to read and interpret database documentation; ability to
conduct a good reference interview; selection of appropriate databases and fields for
searching; design of a search strategy likely to produce relevant output; and evaluation of
search strategies. None of these are purely technical skills, like typing, for example. They
involve intelligence, judgment, and knowledge of principles. Practice in using a particular
online system can help students learn principles.

Finally, Powell and Raber (1994) conducted a survey to investigate how LIS students
were being educated for careers in a changing reference/information environment. They
observed a gradual shift in focus from the consideration of titles and questions to the
broader concerns of information service. Educators indicated that basic reference courses
in the future must provide students with the ability to fully grasp the implications of
information technology. Foreshadowing the impact of the Internet, they concluded that:
“Educators recognize that information refuses to stay within traditional formats and
institutional arrangements, and librarians must learn how to find, retrieve, and deliver traditionally inaccessible information by means of technology” (p. 165).

In summary, education for reference work has evolved as the practice of reference has changed. There is still considerable emphasis on the tools, but less emphasis on specific titles and more on search strategy. More emphasis is also being given to the reference interview and the range of reference services. Treatment of technology has varied—telephone reference has received little special attention, while online searching has been part of curricula for 25 years. Although there is increasing integration of digital resources into the basic reference course, for an extended period of time online searching was the focus of a separate course at many schools. The next section reports the results of a survey to gauge the extent to which digital reference services, the latest innovation in technology affecting reference, are being integrated into basic reference courses.

III. Survey Results

To date little has been written about education and training for digital reference services. In order to gauge current practice in master’s degree programs, in June 2002 I distributed a brief e-mail survey to full-time faculty who teach reference at one of the ALA-accredited LIS schools. Individuals were identified from school Web pages, located by using the Directory of Accredited LIS Master’s Programs on the American Library Association Web site (http://www.ala.org/alaorg/oa/lisdir.html). Sixty individuals were contacted and 33 responded, representing faculty from 25 schools (21 U.S. and 4 Canadian). While limited to full-time faculty (and thus excluding adjunct faculty who may also be involved in teaching reference) and representing 45% of the accredited schools, the responses are at least indicative of the current state of the art.

The survey consisted of four main questions:
1. Have you incorporated “digital reference services” as a topic in one or more of your courses? [Those responding “yes” were asked to indicate which course(s) and through what means (lectures, guest speakers, readings, and/or assignments). If assignments are used, respondents were asked to briefly describe them.]
2. Have you taught a Web-based version of one or more reference courses? [Those responding “yes” were asked to indicate which course(s) and how the course(s) were adapted for delivery via the Web. Respondents were also asked to comment on whether they felt students in a Web-based course are gaining experience that will be useful to them as “digital reference librarians” and in what way.]
3. Has your department/school sponsored any continuing education programs related to digital reference services? [Those responding “yes” were asked to indicate the scope of such programs and the intended audience.]
4. What topics and issues do you feel I should address in a white paper on Education for Digital Reference Services?

Responses to each of these questions are summarized in the following paragraphs.

Treatment of digital reference services. Respondents indicated that some attention is given to digital reference services in almost all of the basic reference course offerings,
primarily through lectures and readings, and occasionally through guest speakers involved in digital reference. Other courses cited as including coverage of digital reference topics are government documents, social science reference, humanities reference, health sciences reference, library instruction and information literacy, information searching, advanced information searching, academic library administration, and special libraries. One respondent noted that a number of her students explored selected topics related to digital reference services in depth through independent studies.

A number of faculty seek to give their students practice in digital reference. E-mail reference is the most common focus of these assignments. Through the generous support of Patricia Memmott of the Internet Public Library (http://www.ipl.org/ref) staff, students from several schools in addition to the University of Michigan gain practice responding to patron questions via e-mail. Other schools use the Virtual Reference Desk and AskA services for this purpose. Students typically answer questions for the service and write a paper based on their experience. Giving students practice in real-time digital reference via chat has proved more challenging. While students can experience such services as users, software commonly used to support the service in libraries (such as that from LSSI) has not been readily available until recently for students to gain practice as a provider.

Other assignments seek to hone students’ skills in: comparative evaluation (traditional sources vs. AskJeeves; AskA services vs. search engines; critiquing one’s experience using digital reference services offered by academic or public libraries, similar to traditional “observation” assignments used in reference courses with particular attention to the reference interview and sources used in responses); analysis (studying a corpus of e-mail queries to determine topical emphasis and implications for collection development, subject reference expertise, and staffing levels); Web-site design; service design using a team approach; assessing online information literacy tutorials; and discussing distance education support service options.

Web-based course offerings. While several respondents indicated that the Web is being used increasingly as an adjunct to their face-to-face reference instruction, only eleven of the respondents currently offer Web-based courses. No specific evidence that learning in this mode enhances expertise in digital reference was given. Potential benefits noted included: students use electronic reference sources extensively (because the instructor cannot assume all students have access to the same print collection); students are more comfortable with technology; and students gain awareness of the advantages and disadvantages of technology as they use it. Chandler (2001) describes how she adapted the reference course at the University of North Texas for delivery via the Web.

Continuing education programs. Relatively few respondents indicated sponsorship of any continuing education programs related to digital reference services. Some schools provided access to videoconferences on the topic produced by other organizations. The University of Michigan, Kent State University, Syracuse University, and the University of Maryland are examples of institutions that have offered short courses for practitioners. For example, the University of Maryland’s Virtual Reference Workshop 1.0 has a focus on sharpening reference skills for the live, online environment. Lynn Westbrook of Texas Woman’s University secured grant funding from the Institute of Museum and Library
Services to develop an educational program in digital reference for librarians from small academic libraries in Texas.

**Issues in teaching digital reference services.** Several respondents indicated issues in digital reference services in need of further research. These are addressed in section V below. Challenges specific to teaching master’s students about digital reference services were twofold: 1) the sense that basic reference courses are already “swamped” and it is difficult to integrate additional topics; and 2) the need to give students practice in being digital reference librarians, but lacking supporting materials and access to appropriate software. There are also conceptual/philosophical challenges—to what extent is digital reference fundamentally new vs. a logical extension of content already covered? The next section addresses these challenges by focusing on the experience of one reference instructor at one school where reference has been taught for six years via the Web.

IV. **Case Study: University of Illinois at Urbana-Champaign**

Library (and information) science courses have been offered in Urbana-Champaign since 1897. Five years later, Isadore Gilbert Mudge, Reference Librarian and Assistant Professor, published a brief article on instruction in reference work at the Illinois State Library School. She identified multiple goals for the reference courses:

The purpose of the courses in elementary and advanced reference work at the University of Illinois, stated briefly, is to familiarize students with the general aims and methods of reference work, to give them a working knowledge of the principal reference books, to develop the power of research and the ability to follow a clue quickly from book to book for more difficult questions, to cultivate rapid thought and quick answers for simpler questions and to test and increase general information. The purpose is accomplished in two ways, by class instruction and recitation and by independent practical work not directly connected with any class exercise. (Mudge, 1902, p. 334)

Assignments included questions that had actually been asked at the reference desk in the university library. “A statement of the amount of time spent upon these problems is required, and, as work is graded for both accuracy and speed, rapid work is encouraged” (p. 334). Work experience in the university library included practice in maintaining various indexes and records, including “a card index for all difficult or frequently repeated questions” (p. 334). Students also developed lists of reference sources for the programs of various women’s clubs of Champaign and Urbana and for university classes, debates, etc. There was also an emphasis on the need continually to learn broadly: “To help the students to acquire this information and to impress upon them the necessity of keeping abreast of the times, work in current events is combined with the course in advanced reference” (p. 335). Mudge’s description of the course concludes with a sample quiz in which students had to identify sources where they would expect to find information on such questions as: 1. Where to find good biographical sketch of Cardinal Wolsey?; 2. What was the Ostend manifesto?; 3. Who is president of Ohio State University?; 4. What is the national debt of Russia?; 5. Who is editor of the *Atlantic Monthly*?.
The goals of my course LIS 404LE Reference and Information Services, though expressed in somewhat different language compared to those of Mudge, are still quite similar (though without the emphasis on testing and increasing general information). [Recent research by Dilevko and Dolan (1999) leads them to conclude that LIS schools might wish to stress the value of keeping up with current events in the syllabi of any reference courses that they offer.] The scope of the course includes: Reference services in all types of libraries and information centers; examination of widely-used print and online sources; and development of question negotiation skills and search strategies. At the end of the course, the student will be familiar with: reference services for different user communities; basic types and representative samples of general reference sources; and basic search strategies for print and online sources.

I have taught reference-related courses (basic reference, science reference, online searching) since 1977. For the first 20 years, these courses were taught face-to-face to on-campus students, with a computer laboratory component for online searching. To reflect the continuing changes in the world of practice, these courses have been regularly revised and updated. Beginning fall 1997, I have offered the basic reference course in a Web-based format to our distance students and more recently adapted the science reference course to this format as well. A previously published paper (Smith, Lastra, & Robins, 2001) describes in some detail the structure of the LEEP (online M.S.) program and the changing roles of instructors and students in LEEP. The LEEP technology includes: bulletin boards for asynchronous communication; a virtual classroom environment for “live”, real-time sessions (streaming audio for lectures by the faculty member, text chat for discussion by the students, pushing of web pages for viewing by the students under the control of the faculty member); and an archive of all parts of each live session (audio, text chat, URL’s for Web pages displayed). For the purposes of this white paper, the focus of discussion is on how learning in this mode may contribute to enhancing students’ knowledge, skills, and attitudes as future digital reference librarians, as well as some parallels between the experiences of online instructors and digital reference librarians.

In a recent presentation, Chris Dede (2002) of the Harvard Graduate School of Education used the expression “learning in chords” to characterize some experiences in Web-based learning. I find this a useful metaphor for describing the experience of students in a Web-based reference course. By virtue of learning via the Internet, they are gaining facility in using the technology while also developing expertise in the subject matter of the course. As I see a number of parallels between online teaching and digital reference services, I will first explore the changes in roles that we have observed in a study of LEEP faculty (additional details can be found in Smith, Lastra, and Robins, 2001).

Web-based courses such as those offered in LEEP alter familiar patterns of time and place and new roles emerge. Parallels with digital reference librarians include the following:

**Teaching as collaboration.** Unlike the autonomous classroom teacher, the online teacher collaborates with technology support staff in delivering instruction. The online environment also allows collaboration at a distance, drawing on guest speakers in any location. Digital reference librarians must collaborate with technical support staff to maintain the medium through which they communicate with patrons. They can also
collaborate with reference librarians in other sites to answer questions through referral. For example, Penka (2003) identifies several types of cooperation in digital reference and illustrates how different levels of cooperation are used in answering questions through QuestionPoint.

**Teaching as public (and permanent) performance.** LEEP technology, through electronic bulletin boards and archives of the audio, slides, and text chat of live sessions, creates a much more complete (and potentially permanent and publicly accessible) trace of the act of teaching. There are definitely potential benefits to such a complete record—students, peers, and the faculty member himself or herself can review “performances” that would otherwise be ephemeral. But this permanence may also be somewhat intimidating, especially to anyone teaching in this environment for the first time and for whom each aspect of the course is an experiment. In digital reference services the transcripts of chat sessions and archived question-and-answer pairs are similarly more complete traces of the act of question answering than we have for face-to-face or telephone reference.

**Teaching as creating a learning environment.** The content and organization of the virtual classroom space are planned to support the learning objectives of a given course. The teaching strategy may shift from “sage on the stage” to “guide on the side”, as students explore aspects of the course both independently and under the guidance of the instructor. Similarly in digital reference, we may seek to make the “information landscape” more understandable to our patrons through design of digital reference collections and instructional materials.

**Teaching as media management.** Media management involves deciding which activities to allocate to synchronous, asynchronous, and face-to-face communication channels, taking advantage of the strengths of each medium. Similarly digital reference librarians must learn which types of questions can be handled synchronously via chat vs. asynchronously via e-mail, and when computer-mediated communication needs to be supplemented with telephone or face-to-face discussions.

**Teaching 24/7 and time management.** No teacher can be available 24/7, but one can no longer treat teaching as a one day per week responsibility. Similarly digital reference librarians must be more open to service provision at times that are convenient for the patron.

**Teaching as computer-mediated communication.** Faculty must learn to compensate for limitations of the available digital communications media—in LEEP live sessions faculty can speak, but they must translate words that the students type as indications of understanding, puzzlement, or frustration that might otherwise be expressed nonverbally. Asynchronous communication using the bulletin boards and synchronous communication using text chat are completely text-based and thus writing- and reading-intensive. Faculty members must be skillful writers as well as interpreters of others’ written communication (and it certainly helps to be a touch typist!). Likewise the digital reference librarian who has refined oral interviewing skills must now adapt to text-based communication.

**Teaching assistantships: new forms of partnerships.** The archive of live sessions also facilitates a more in-depth dialogue about the process of teaching between the faculty
member and the teaching assistant. Together, they can review the archive and discuss what worked and what could be improved in a particular class session. Transcripts of digital reference interview and question answering sessions should be similarly helpful in training reference staff.

The themes identified above can serve as a framework for communicating to faculty and students new to LEEP how it may differ from their prior experience in teaching and learning. To the extent that these same themes highlight particular characteristics of the digital reference environment, they may be useful in education and training of digital reference librarians as well. The online environment is significantly different from that of a traditional classroom and therefore requires considerable self-reflection on the part of the faculty member. A common theme in interviews with LEEP faculty is the observation that faculty who teach in LEEP become much more self-reflective, not only about their teaching in the online environment but also about what they do (almost intuitively) in the face-to-face classroom. The extent to which this contributes to increased quality in teaching, in whatever setting, deserves further investigation. Do digital reference librarians likewise become more self-reflective about the conduct of their work in face-to-face as well as computer-mediated encounters?

A brief description of the basic reference course I have taught online can be used to illustrate the “learning in chords” aspect of learning online—the students gain facility in using the technology while also developing knowledge and skills that are likely to be directly relevant to digital reference services. The basic text used is *Reference and Information Services: An Introduction* (Bopp & Smith, 2001) and additional readings are made available through electronic reserves. Students have participated in the class from many of the 50 states including Alaska as well as such countries as France, Italy, Argentina, and Japan. Live sessions are scheduled approximately every other week; in alternate weeks there are “live” office hours, in which students can connect to the course Web site and ask questions via text chat, with the instructor responding via text chat. Text chat is also the medium for asking questions during lectures in regular class sessions as well as for collaborating in real time on group projects (in which group members are often distributed across multiple time zones). Lectures are intended to give the students a framework for navigating the digital information landscape, with links provided to many sites which they are encouraged to explore in more depth on their own. Instruction in online searching involves real-time demonstrations of searching Dialog, with students viewing the commands as they are typed by the instructor and the system responses as they appear on the instructor’s screen.

Assignments are of four types: sources (locating answers to sets of reference questions and a final exercise focusing on assessment of the strengths and weaknesses of Internet resources); services (examination of issues in digital reference services—instruction, organization of reference services, and services to specific populations; participation in an electronic journal club, a small group discussion of recent journal articles in a specific topic area); online (basic commands and features associated with online retrieval systems often used in reference work); and Internet Public Library Ask A Question Service (volunteering as a digital reference librarian, answering at least five questions). The syllabus for the most recent offering of LIS 404LE Reference and Information Services can be found at [http://leep.lis.uiuc.edu/fall02/LIS404LEA/index.html](http://leep.lis.uiuc.edu/fall02/LIS404LEA/index.html).
The syllabus for LIS 412LE Science Information Sources and Reference Services can be found at [http://leep.lis.uiuc.edu/spring03/LIS412LE/index.html](http://leep.lis.uiuc.edu/spring03/LIS412LE/index.html). Discussion here will focus on aspects of these courses related to digital reference services:

1. **Experience in text chat.** Students have repeated opportunities to use chat in dialogues with other students and with the instructor.

2. **Experience in e-mail reference.** The Internet Public Library (IPL) assignment illustrates best practices for e-mail reference work; virtual training (Patricia Memmott conducts a live training session from Ann Arbor illustrating IPL policies and procedures); development of a knowledgebase (students post their IPL questions and answers on a shared class bulletin board, providing many exemplars of digital reference questions); and practice in using free digital sources to answer reference questions, since IPL discourages use of licensed databases.

3. **Exposure to librarians with real-world experience.** Invited guest speakers participating in live sessions have included Sarah Wenzel discussing implementation of chat reference service at MIT using LSSI software and Janette Shaffer discussing distance education and virtual reference at the McGoogan Library of Medicine, University of Nebraska Medical Center.

4. **Experience in using digital resources.** Because students have access to diverse print reference collections, varying in size and composition, they use a wide range of sources in answering the questions in the sources assignments. While they are encouraged to use print sources where available, they often explore digital resources and gain a good appreciation for their strengths and weaknesses. Multiple strategies for the same question are shared via the bulletin boards, demonstrating the relative value of print and purchased or licensed digital reference sources vs. freely available Web-based sources in answering questions. Consideration of the various categories of reference tools (e.g., geographical sources, biographical sources) reveals that coverage is uneven. Some questions are readily answered using freely-available digital resources, while others require access to a good library reference collection.

5. **Experience creating digital resources.** The science reference course includes the assignment of creating a webliography, a topical guide to selected Web sites. Topics selected by the students have ranged from Science Fair Project Resources to Biodiversity in Illinois and Bioethics.

6. **Electronic journal club as a form of continuing education.** Discussion of recent articles is modeled on Medical Library Association guidelines for electronic journal clubs (see [http://www.mlanet.org/education/telecon/jcguide.html](http://www.mlanet.org/education/telecon/jcguide.html)). Students are free to use text chat or a group bulletin board as the medium for small group discussion.

7. **Confronting the issues in provision of digital reference services.** Students investigate and write short papers on such topics as: assessment of Web-based instructional materials; issues in developing policies and procedures for supporting Web-based reference service delivery; how Web-based systems hinder or help information access by specific populations (e.g., low-literate adults, children, seniors).

So how does this compare to what students learned in Miss Mudge’s courses one hundred years ago? Apart from the obvious difference of using technology, there is the marked difference in the “information environment” in which librarians function. In 1902, reference librarians had to perform in an environment of information scarcity, mining their local print collections to answer questions. In 2003 reference librarians must function in an
information-rich environment, going beyond local print collections to a wide range of licensed and freely-available digital resources.

Educational outcomes research is needed to determine whether learning reference online leads to enhanced performance as a digital reference librarian. At this point the evidence is anecdotal, based on my experience and feedback from my students. The voice of one student (who worked in an academic library outside Illinois while pursuing her degree via LEEP) concludes this case study. After describing how courses in reference, online information systems, change management, and information storage and retrieval would contribute to her ability to support digital reference services, she continues with some more general observations about the value of the LEEP experience:

“As a LEEP student I was mostly reliant on digital reference assistance. I learned what worked for me and what was a frustration. Fast turnaround time (or at least a notification that your request is being processed) is vital. Where the information was coming from was not always clear. Fortunately the librarians at UIUC are fabulous and I did not have any bad experience.

By nature of the requirements of the program [I] had to become comfortable in a digital environment. Learning html coding and xml were very valuable in helping me understand that the person I am assisting may not be seeing the same thing I think I am sending them. [The LEEP technical support staff] are wonderful at helping us learn on the fly. Getting a handle on platforms and formats is a necessary part of long-distance reference. Learning to walk someone through a glitch at their end is a vital skill to learn.

Sitting through the classes in LEEP means that you are interacting with people that you may not have met, so learning to ‘read’ someone from just text turns out to be a skill that still needs exploration, but LEEP students have a leg-up in that respect. Of course, the younger generations who do a lot of live text chat room stuff are rapidly developing these skills anyway.

It is also a fine art to steer a conversation in the right direction and make sure everyone is on the same page without visual cues and immediate feedback/correction. Even synchronous sessions have a time delay built in. I also learned that some things require live phone conversations, not just text chats.

I learned many little ways to help online classmates feel more comfortable through watching the styles of various teachers. Some weren’t very efficient at keeping up with the text chat while presenting information. Some were fabulous at it. Some of the things that helped were reading the comments and questions out loud before answering them, and constantly mentioning people’s names to make sure they are ‘checked in’.

The archived class sessions turned out to be very valuable. Sometimes things fly by so fast you don’t get it all. Being able to go back later and find exactly what you need—usually through the url’s listed—was an excellent tool and something I would hope we will be implementing for those who use digital reference services.

Of course, the best education and preparation was watching [my institution] implement some of their Digital Reference services—streaming audio for reserves, pdf’s for text, the live chat at the university’s main reference desk. I used all these services both from a student perspective and from a library employee perspective. So I had the unique opportunity to learn about the architecture of these systems from classes, then see the implementation and de-bugging in a library setting. I also watched and listened as my
colleagues [in professional associations] struggled with these issues—hence the [listserv] and the frustrations vented there.”

This narrative is a reminder that an online student may have many teachers—her professors, fellow students, technology support staff, reference librarians, work colleagues, and professional colleagues. The learning is not confined to what is taught in the basic reference course.

V. Issues and Challenges in Education for Digital Reference Services

In reviewing the surveys of reference instructors and the current literature on digital reference services, several issues relevant to education for digital reference services emerged. The overarching issue, as expressed by Joe Janes in his response to the survey, is “how we adapt education for reference work to education for whatever reference work is becoming.” The following issues suggest needed lines of research to enhance education for digital reference services.

Relative importance of tasks. As noted in the discussion of the history of education for reference services, much effort in the past has focused on equipping students to answer ready reference questions. In preparing students for the current workplace, more comprehensive data on digital reference service patterns in different types of libraries would be helpful. What proportion of questions are answered face-to-face, by telephone, by e-mail, by chat? What types of questions are reaching reference librarians in each of these modes? What types of questions are best suited to each of these modes? Janes (2002b, p.3) notes that this “may be the last generation of reference librarians who could concentrate on ready reference as a major component of their work lives.” Knowing more about the questions that are reaching digital reference librarians would be helpful in preparing students to answer them. As McGlamery (2001, p. 348) observes, “Our remote web-community user leaves a trail of data, transaction logs, database queries and calls to Java applications, which, while not a measure, can be used to take the measure of the user…. This data could be collected and used more effectively than it is at present.”

It is anticipated that the distribution of types of questions will vary by type of library, but it is clear from early reports of real-time reference that the distribution is not what some service providers anticipated. For example, in a case study of instant messaging reference in an academic library, Foley (2002) reports that the majority of questions received fell into the information literacy (26%) and catalog (23%) categories. Information literacy questions required the librarian to explain the difference between the online catalog and electronic databases, to suggest a database, or to offer database search tips. The catalog category included questions about specific holdings or catalog terminology. Other categories of questions included requesting help navigating web pages, inquiries about specific library information such as hours and policies, technical troubleshooting, and electronic course reserves. Surprisingly, only five percent of users asked in-depth questions about a particular subject while two percent posed short, factual questions (more had been expected). In a study of the recently introduced chat reference service at UIUC, Kibbee, Ward and Ma (2002) report 1/3 of questions relate to finding specific library materials, 30.5% to information about the UIUC library and services, 20.2% subject-based
research, 9.1% ready reference, 5.3% technical problems, and 1.7% questions about the service. They conclude that the high proportion of questions relating to UIUC library resources and services calls into question the feasibility of inter-institutional collaboration to answer chat reference questions. The results of both of these studies suggest that digital reference librarians, at least in academic libraries, need to be prepared to offer some instruction. Diamond and Pease (2001) note that the full range of questions found in face-to-face reference are likely to be asked of a digital reference service if libraries do not try to limit questions to ready reference through service policies. Sloan (2002) outlines question categories observed in several different studies of digital reference. Ellis and Francoeur (2001) present a case for applying information competency standards to digital reference services in academic libraries and refer specifically to the Association of College and Research Libraries Information Literacy Competency Standards for Higher Education (http://www.ala.org/acrl/ilstandardslo.html). They suggest that such standards can provide “an overarching framework to understand what it is that students need to know about finding and using information; from this understanding, librarians can then decide what level of instruction they can accomplish in digital reference interactions and can plan their services accordingly” (p. 5). Coffman (2002a) suggests that a digital reference service will prove valuable if it takes into account the types of help that people are likely to need on the Web, such as finding authoritative information, finding unbiased information, and going beyond resources that are freely accessible.

**Staffing models and disintermediation.** Related to the distribution of tasks is the issue of roles: what types of positions must digital reference librarians fill and what tasks formerly performed by reference librarians are being eliminated through the process of disintermediation? Dougherty (2002, p. 46) contrasts typical reference duties 10 years ago with typical duties today: Answering reference questions at the desk or by telephone; consulting online catalogs and teaching users how to use them; and working on collection development and evaluation of print resources vs. face-to-face, e-mail, and Internet reference services; technical tasks, including functioning as a Webmaster; preparing tutorials; learning how to use new software; designing gateways; and more and more training of other staff, users, and oneself. Even within a single digital reference service, there can be a need for role differentiation. Based on their experience with the Internet Public Library, McClennen and Memmott (2001) offer some guidance on roles and staffing models. They note that “the language used to discuss traditional desk reference was simply not adequate to describe this separation of roles in a new and more complex domain” (p. 148). They offer a new model to provide a basis for further discussion and research about the process of digital reference and as a framework upon which decisions about digital reference practice can be made. Roles discussed include: 1) patron asking of questions (need for adequate support of reference interview through design of Web form, e-mail template, or chat script); 2) filterer—apply policy to determine if questions asked are within scope; 3) answerer; 4) administrator—keep service consistent and running smoothly on a daily basis; 5) coordinator—oversee the “big picture” by defining and implementing policies and procedures that make possible the operation of the service (choose software, develop procedures, train new staff members, make personnel decisions). Ferguson (2000), providing a broad view of next generation information services, defines roles that he terms integrator, collaborator, colleague, access engineer, and leader.
As Crawford and Gorman (1995, p. 107) note, “the history of progress in librarianship is one of decreasing the need for mediation” through such devices as public catalogs, open shelves, and accessible reference collections. As one considers design of digital reference services, the question therefore is not the presence or absence of mediation but the degree of mediation that is desirable and affordable. In an information-rich environment, intermediaries can still play a role in helping users articulate their questions and locate appropriate information sources, whether print or digital. In addition reference librarians, by remaining in touch with current users of information, can contribute to new information architectures and help design interfaces that support more skillful information retrieval. Time spent in indirect reference may increase in a virtual environment as librarians develop virtual reference collections, navigational aids, and tutorial material. One indicator of success in this effort may be the complexity of questions coming to virtual reference desks. If the products of indirect reference service enable more straightforward questions to be answered by users themselves, then direct reference service may focus on providing responses to more challenging questions and in-depth instruction.

**Competencies and guidelines.** Statements of competencies and guidelines, formulated by professional associations, offer guidance in curriculum and course development. See, for example, the list of educational policy statements at [http://www.ala.org/alaorg/oa/educpol.html](http://www.ala.org/alaorg/oa/educpol.html) and the reference guidelines at [http://www.ala.org/rusa/standard.html](http://www.ala.org/rusa/standard.html). In what ways do these need to be updated to guide education for digital reference services? In particular, given the importance of the Guidelines for Behavioral Performance of Reference and Information Services Professionals ([http://www.ala.org/rusa/stand_behavior.html](http://www.ala.org/rusa/stand_behavior.html)) as demonstrated in research reported by Saxton and Richardson (2002), what adaptations are needed for effective computer-mediated communication? What do we need to know, beyond traditional site-based reference, to effectively create, operate, and manage such a service? Experienced providers can be helpful in articulating “skill sets”, such as the list provided by Sara Weissman (Lankes & Kasowitz, 1998, pp. 131-133) that includes: read domain names of e-mail addresses to identify likely source of a query; use tools like *American Library Directory* and LibWeb to locate remote patrons’ nearest collections; recognize limitations of the query as stated; know when to refer; ability to explicate universes of information and to explain limits of different types of information resources.

**New frameworks or models.** Several widely recognized genres of reference books (e.g., encyclopedias, dictionaries, biographical sources) and specific titles (e.g., *Encyclopaedia Britannica*; Webster’s *An American Dictionary of the English Language*; *Dictionary of National Biography*) predate the widespread availability of reference services in libraries (McArthur, 1986; Rettig, 1992). It is therefore not surprising that instruction in reference question answering has often been framed along these lines. In a textbook for students of reference, Jahoda and Braunagel (1980) offer this model of the reference process: 1) analyze the query to determine the subject of the request and the type of information needed; 2) determine whether any clarification or amplification of the query is required; 3) identify categories of reference tools likely to contain the type of information needed; 4) select specific titles to search; 5) locate answer (translate query words into language of answer-providing tool); 6) communicate to patron and determine if satisfactory. Experienced reference librarians were sometimes called “Walking Winchells”, reflecting their mastery of categories and titles in the *Guide to Reference*
Books (Winchell, 1951). These traditional frameworks for thinking about the structure of the reference universe are in need of revision. New aggregations are creating new genres of reference sources and thus the need for new strategies for searching. See, for example, the description of Oxford Reference Online (http://www.oxfordreference.com) and Hodgkin’s (2002) description of Xrefer.com, which incorporates works from a broad range of publishers, providing a common searching interface to all the resources as well as improved browsing possibilities. Digital reference librarians must become familiar with the “deep web” (Bergman, 2001) of searchable databases as well as the “surface web” typically probed by widely-used search engines. In choosing between print and digital sources, reference librarians must develop an understanding of how well digital reference handles various kinds of questions. Janes (2002a) reports the results of a survey of reference librarians that included an assessment of this, with some differences in the judgment of academic and public librarians as to what types of questions were best suited to digital reference.

In addition to the type-of-reference-source framework for question answering, librarians have multiple mental frameworks for library research models (Mann, 1993). These frameworks can limit approaches used in locating information. Research is needed to develop new frameworks that will help digital reference librarians determine the best way of answering specific types of questions when several alternate paths are available. The sense of an ordered physical world of published materials was intrinsic to the practice of reference for many years; new conceptual frameworks are needed to address the complexity of the new information environment created by the Internet.

**Standards and cooperation.** Topics that have been part of cataloging education for several years, such as the role of standards, are now becoming salient for reference courses (Caplan, 2001, p. 5). Possible areas for standardization include: exchange format for queries and answers, interoperability of knowledgebases, standard metrics for measuring service levels, and performance standards for quality of service. Education for digital reference services should include attention to the efforts of standards bodies such as Networked Reference Services: Standards Committee AZ (http://www.niso.org/committees/committee_az.html). Factors related to successful collaboration and cooperation also need to be explored, especially as collaboration in provision of digital reference services extends from the local or regional level to collaboration around the globe. Coffman (2002b) raises a number of questions regarding collaborative digital reference that need further investigation.

**Intellectual property issues.** Point IV of the American Library Association Code of Ethics states “We recognize and respect intellectual property rights” (http://www.ala.org/alaorg/oif/ethics.html). As librarians develop digital reference services for reaching patrons at a distance, they must be cognizant of issues related to copyright laws, license agreements, and appropriate use of print and digital resources in a global as well as a national context.

**Integrating relevant research.** Part of educating students is making them aware of the disciplines that may generate research that can contribute to enhancements in digital reference services. This can include social informatics in digital library research (Bishop & Star, 1996), computer-supported cooperative work (Twidale & Nichols, 1998), computer-
mediated communication (Herring, 2002), and interface design (Marchionini & Komlodi, 1998). On the applied side, the relevance of studies of other e-services (Chidambaram, 2001) should be considered.

**Communication skills.** Digital reference is currently accomplished using asynchronous or synchronous computer-mediated communication. Education for digital reference services should include becoming proficient in using such tools as electronic mail and chat to handle questions from remote patrons. Abels and Liebscher (1994) note that LIS schools can play an important role in developing instruments for electronic reference interactions and in educating and training information professionals in communicating over electronic channels. As an understanding of skills needed develops, these should be integrated into educational programs. Tibbo (1995) offers guidance in interviewing techniques for remote reference, noting that it is unfortunate to treat electronic mail reference just the same as postal service reference. Francoeur (2001) supports further analysis of what is gained and lost when communicating by chat as opposed to doing so face-to-face. He suggests that a close analysis of chat reference interaction that is informed by insights from the fields of communications, linguistics, cognitive science, and psychology would be helpful. Chat communication tips specific to reference are beginning to appear (http://www.uflib.ufl.edu/hss/ref/rxchat.html). While Straw (2000) notes that the key element in making the digital reference interview work is good written communication, those preparing to offer such a service can benefit from more explicit guidance. Smith and Harris (2001) offer a preliminary review, contrasting the skills needed in asynchronous vs. synchronous digital reference communication. In particular, synchronous interactions require the ability to interact effectively in a chat environment, speed typing, quick thinking, and mastery of the mechanics of the software employed. Answering questions in both modes depends on knowledge of Web resources and efficient search techniques, rapid evaluation of the quality of Web resources, written communication skills, compensation for lack of nonverbal cues, and the ability to project an online presence in the virtual environment. There will also be a need to develop specific types of interaction skills, such as dealing with “problem patrons” (Taylor & Porter, 2002).

**Technological skills.** Published reports of digital reference services suggest that one category of questions received can be characterized as “technology troubleshooting.” This raises the issue of what level of technical support should digital reference librarians be prepared to provide and how can they best acquire such knowledge and skills. For example, a recent book on strategies for the “high-tech reference desk” includes multiple chapters on “the librarian as information technician” (McDermott, 2002).

**Preserving values, added value, and evaluation.** The final cluster of issues in education for digital reference services revolves around preserving values, adding value, and evaluation. How can the values that underlie face-to-face reference be made manifest in digital reference? What value do digital reference librarians add compared to what the questioner can accomplish on his or her own? And what are useful metrics for evaluating performance in digital reference services?

In their paper discussing values-based reference service for the largely digital library, Ferguson and Bunge (1997) assert that “Respect for users, in all their diversity and complexity, will continue to be at the center of the library’s value system. The constant
pursuit of knowledge of users’ needs and their information-seeking and use behavior will increase the effectiveness with which information services are designed” (p. 262). Furthermore, “the challenge for reference service in the largely digital library will be how to extend this human touch to highly diverse and widely dispersed clients whenever and wherever they want and need it” (p. 264). Similarly, Cullen (2001) writes that “the user’s time and convenience, the dedication of the system to answering their most complex enquiry and a focus on service quality in service delivery will be the driving values in this new paradigm” (p. 36). Despite the new structures of knowledge and the new means of communication, human factors and human needs remain. As Nardi and O’Day (1999) remark regarding their study of the work of reference librarians, “we were struck by the ‘high-touch, high-tech’ service librarians provided their clients. The latest technologies were in use, and they were used efficiently and effectively. But right alongside them was the enactment of the librarians’ ethic of service. The librarians contributed their special human abilities of tact, diplomacy, judgment, and empathy” (p. 212).

One aspect of education for digital reference services is encouraging students to consider how to serve the needs of diverse groups of users. What is the applicability of digital reference services to different age groups? Are there digital divide issues? Barriers to use by individuals with disabilities? Achieving principle I of the ALA Code of Ethics (“We provide the highest level of service to all library users through appropriate and usefully organized resources; equitable service policies; equitable access; and accurate, unbiased, and courteous responses to all requests”) means considering the needs of diverse user groups.

More studies are needed to better understand and articulate the added value that digital reference librarians can bring to question answering now that library users have more options for searching themselves or turning to Web-based question-answering services. Librarians may also add value in indirect reference, creating guides to digital resources superior to those available from other sources. Schneider (2002) discusses the Fiat Lux collective of librarians from web portals dedicated to planning a major, high-quality web presence, “a Yahoo! with values and a brain”, providing a single place for links to local and global trustworthy content.

As Hauptman (1989) noted, evaluation (by oneself, a peer, a supervisor) can be an important form of education. Thus education for digital reference must integrate discussion of emerging perspectives on assessing quality. Work by McClure and Lankes (2001) is exploring outcome measures (quality of answers), process measures (effectiveness and efficiency), economic measures (costing and cost effectiveness of digital reference), and user satisfaction. White’s (2001) framework for analyzing and evaluating digital reference services offers another approach. An interesting development at the level of the reference transaction is the Samuel Swett Green Award for Best Reference Transaction, recognizing the best transcript of a virtual synchronous reference transaction (http://www.vrtoolkit.net/greenaward.htm). The criteria for this award suggest factors that contribute to the quality of a reference interview via chat. A recently published manual outlines statistics, measures, and quality standards that can be used in assessing and improving digital reference services (McClure et al., 2002).

VI. Recommendations
The challenges faced in developing education for digital reference services are not without precedent in professional education. Thirty-six years ago, Harvey Brooks (1967) reflected on the challenges he saw for engineering education:

“The dilemma of the professional today lies in the fact that both ends of the gap he is expected to bridge with his profession are changing so rapidly: the body of knowledge that he must use and the expectations of the society that he must serve. Both these changes have their origin in the same common factor—technological change….This places on the professional a requirement of adaptability that is unprecedented.” (p. 89)

“What does all this mean for engineering education? What kind of faculty? What kind of research? What kind of curriculum and courses?” (p. 90)

The previous section on Issues and Challenges suggests the growing body of knowledge that a digital reference librarian needs to master. At the same time the societal context within which libraries function—the publishing and information marketplace, changing modalities of scholarly communication, and evolving capabilities in the user community (Lynch, p. 60)—is becoming more complex, posing challenges for defining the service boundaries of the library. Education of digital reference librarians must prepare them for a future in which users may ignore institutional and national boundaries in their search for information.

As noted early in this paper, education for digital reference services may involve five types of activity: 1) formal sequence of courses as part of the master’s degree; 2) on-the-job training; 3) continuing education (conferences, seminars, workshops, professional association programs, formal university courses, professional reading); 4) evaluation (self, peer, supervisor); and 5) acquisition of substantive, multi-disciplinary knowledge. At this comparatively early stage in the development of educational programs, the goals, scope, and means of each type are still evolving. Sections III and IV of this paper provided some insight into current practice in coursework for the master’s and continuing education. Librarians providing digital reference services may find the need to place increased emphasis on the acquisition of multi-disciplinary knowledge. For example, Helman (2001) notes that reference librarians at MIT who formerly could focus on specialized subject areas now had to have some level of familiarity with a wider range of subject areas in order to successfully staff the virtual reference desk. Cross-training sessions cover the basics of each broad subject area. Hill (2001) suggests strategies for acquiring subject knowledge and Coppola (2001) discusses keeping up with popular culture. Organizations must also give greater attention to ongoing on-the-job training, using techniques such as those described by Block and Kelly (2001). Completing indirect reference tasks may also enhance skills needed for direct reference service in the digital environment. For example, Mitchell and Mooney (1999) discuss how contributing to INFOMINE, a compendium of Web resources, has provided a valuable continuing educational experience. INFOMINE participating reference librarians, perhaps more so than many reference librarians, have a fully developed sense of how and when to best use the Internet and how to search it effectively. In examining sources for possible inclusion, reference librarians learn how to rapidly and effectively navigate Web sites through the hyperlink mazes that often accompany them and to quickly assess the quality of content.
All forms of education for digital reference need to exploit new resources for educational purposes. The following list suggests some steps in this direction.

**Transcripts as teaching tools.** The systems that allow for digital communication make it easy to keep a record of the entire interaction with the patron. Such records can be invaluable for subsequent self- and peer evaluation as well as used as a teaching tool for groups of students (with due consideration for protecting privacy). Carter and Janes (2000) describe their unobtrusive data analysis of Internet Public Library question and answer sessions. In a presentation at the American Library Association conference, Cheng (2002) of Wesleyan University discussed her use of transcripts of real-time chat sessions to monitor the work of both new and more experienced reference librarians. She found that newer librarians showed less knowledge of effective use of print sources, while some of the more experienced reference librarians tended to make less use of Internet resources. Analysis of this type suggests topics for in-house training.

Research completed as part of a dissertation study using transcripts of verbal interviews between reference librarians and patrons suggests a line of research that could be pursued using text transcripts of digital reference transactions (Smith, 1979). The study sought to develop a model of the problem solving process used by a reference librarian (intermediary) in converting the patron interest statement into a current awareness profile that could be processed against one or more databases. The model was used as a basis for determining what parts of this process could be accomplished directly by the computer or through patron-computer interaction, as well as for identifying intermediary expertise which could not be duplicated easily by machine. Analyzing transcripts to determine what kinds of expertise are being brought to bear in answering a patron’s question can provide insights into the preparation needed by digital reference librarians.

**Knowledgebases as teaching tools.** Many libraries maintain question and answer files (recall that Illinois students contributed to these as part of their reference coursework in the early 1900s), but they are generally accessible only to the librarians at a given institution. There are a few exceptions, such as the more than 1700 answers to frequently-asked or difficult-to-answer questions (e.g., How many muscles does it take to produce a smile and a frown?) compiled by The Science and Technology Department of the Carnegie Library of Pittsburgh and published as *Science and Technology Desk Reference* (Bobick & Peffer, 1996). Services like QuestionPoint plan to build up and maintain a knowledgebase of questions and answers. These can become object lessons in organizing and sharing knowledge as well as illustrating reference questions and answers. Knowledgebases also raise interesting research questions for students to investigate: How does a service decide what should be saved? How are saved question-and-answer pairs best organized? What proportion of question-and-answer pairs need to be updated on a regular basis to remain accurate?

**Manuals.** Training manuals (e.g., Lipow & Coffman, 2001) and guides for service implementation (e.g., Lankes & Kasowitz, 1998; Maxwell, 2002; Meola & Stormont, 2002; Lipow, 2003) are examples of resources that can be useful in educating future digital reference librarians. Faculty surveyed for this study expressed an interest in developing an instructional clearinghouse as a mechanism for sharing teaching materials for digital reference.
Collaboration with vendors and service providers. To support teaching of online searching, there are now established classroom instruction programs in which vendors provide access to their systems as an investment in training future reference librarians who are more likely to use these systems once on the job. Faculty surveyed for this paper expressed an interest in similar partnerships with vendors of software for digital reference and related service providers. The Digital Reference Clinical Teaching Initiative (http://quartz.syr.edu/education) seeks to bring together the entire digital reference community interested in issues of education and training to create an initiative to share education materials, education settings (internships and digital reference services like the VRD Learning Center and the Internet Public Library), teaching approaches, and internship opportunities. It is hoped that this collective expertise can come to consensus on core competencies, educational approaches, and possibly a certification process.

In conclusion, it is interesting to recall one aspect of Licklider’s (1965) vision in his book Libraries of the Future:

“The console of the procognitive system will have two special buttons, a silver one labeled ‘Where am I?’ and a gold one labeled ‘What should I do next?’ Any time a user loses track of what he is doing, he can press the silver button, and the recapitulation program will help him regain his bearings. Any time he is at a total loss, he can press the gold one, and the instruction program will explain further how to use the system. Through either of those programs, the user can reach a human librarian.” (p. 127)

Education for digital reference services must prepare the human librarian to supplement and complement what the user can accomplish with whatever version of “procognitive system” is available. As indicated in the discussion of values and value added, it is likely that the roles filled by the human librarian will include: knowledge of a wide range of information sources in print and digital form as part of an information landscape; concern for evaluation and the quality of information; facility with tools and techniques for searching; and an understanding of users and their needs.

VII. References


Coppola, E. (2001). “Do you have any information on the Goth lifestyle?” Or how does a reference librarian keep up-to-date? The Reference Librarian, 72, 171-177.


