Service Perspectives for the Digital Library Remote Reference Services

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We play a cultural role in the sense that librarians have traditionally applied a broader range of knowledge to pieces of information. I think it's high tech and high touch. Bring in high tech, but give it a human face. And that face is the face of a librarian. (Hathorn, 1997)

ABSTRACT

THIS ARTICLE WILL EXPLORE THE ROLE OF THE LIBRARIAN and of the service perspective in the digital library environment. The focus of the article will be limited to the topic of librarian/user collaboration where the librarian and user are not co-located. The role of the librarian will be explored as outlined in the literature on digital libraries, some studies will be examined that attempt to put the service perspective in the digital library, survey existing initiatives in providing library services electronically, and outline potential service perspectives for the digital library.

INTRODUCTION

The digital library offers users the prospect of access to electronic resources at their convenience temporally and spatially. Users do not have to be concerned with the physical library's hours of operation, and users do not have to go physically to the library to access resources.

Much has been written about the digital library. The focus of most studies, papers, and articles has been on the technology or on the types of resources offered. Human interaction in the digital library is discussed far less frequently. One would almost get the impression that the service tradition of the physical library will be unnecessary and redundant in the digital library environment.

DEFINING THE DIGITAL LIBRARY—WHERE DOES SERVICE FIT IN?

Defining the digital library is an interesting, but somewhat daunting, task. There is no shortage of proposed definitions. One would think that there would be some commonly accepted and fairly straightforward standard definition, but there does not appear to be. Rather, there are many. And one common thread among all these definitions is a heavy emphasis on *resources* and an apparent lack of emphasis on librarians and the *services* they provide.

The Association of Research Libraries (ARL) notes: "There are many definitions of a 'digital library'. . . .Terms such as 'electronic library' and 'virtual library' are often used synonymously" (Association of Research Libraries, 1995). The ARL relies on Karen Drabenstott's (1994) *Analytical Review of the Library of the Future* for its inspiration. In defining the digital library, Drabenstott offers fourteen definitions published between 1987 and 1993. The commonalties of these different definitions are summarized as follows:

- The digital library is not a single entity.
- The digital library requires technology to link the resources of many libraries and information services.
- Transparent to end-users are the linkages between the many digital libraries and information services.
- Universal access to digital libraries and information services is a goal.
- Digital libraries are not limited to document surrogates; they extend to digital artifacts that cannot be represented or distributed in printed formats. (p. 9)

One interesting aspect of Drabenstott's summary definition is that, while there is a user-orientation stated, as well as references to technology and information resources, there is no reference to the role of the librarian in the digital library.

Another report by Saffady (1995) cites thirty definitions of the digital library published between 1991 and 1994. Among the terms Saffady uses in describing these various definitions are: "repositories of...information assets," "large information repositories," "various online databases and...information products," "computer storage devices on which information repositories reside," "computerized, networked library systems," "databases...accessible through the Internet," "CD-ROM information products," "database servers," "libraries with online catalogs," and "collections of computer-processible information" (p. 223). Saffady summarizes these definitions by stating: "Broadly defined, a digital library is a collection of computer-processible information or a repository for such information" (p. 223). He then narrows the definition by noting that "a digital library is a library that maintains all, or a substantial part, of its collection in computer-processible form as an alternative, supplement, or complement to the conventional printed and microform materials that currently domi-

nate library collections" (p. 224). Without exception, each of the definitions Saffady cites focuses on collections, repositories, or information resources.

In another paper, Nurnberg, Furata, Leggett, Marshall, and Shipman (1995) ask "Why is a digital library called a library at all?" They state that the traditional physical library can provide a basis for discussing the digital library and arrive at this definition: the traditional library "deals with physical data" while the digital library works "primarily with digital data." Once again, a definition that is striking in its neglect of service perspectives. In a paper presented at the Digital Libraries '94 conference, Miksa and Doty (1994) again discuss the digital library as a "collection" or a series of collections. In another paper, Schatz and Chen (1996) state that digital libraries are "network information systems," accessing resources "from and across large collections."

What do all these definitions of the "digital library" have in common? An emphasis on technology and information resources and a very noticeable lack of discussion of the service aspects of the digital library. Why is it important to take a look at how the digital library is defined? As more definitions of the digital library are published, with an absence of the service perspective and little treatment of the importance of librarian/ user collaboration, we perhaps draw closer to the Redundancy Theory (Hathorn, 1997) in which "the rise of digitized information threatens to make librarians practically obsolete." People may well begin to believe that, as physical barriers to access to information are reduced through technological means, the services of the librarian are no longer as necessary.

HUMAN ASPECTS OF THE DIGITAL LIBRARY

While considering the future, it sometimes is helpful to examine the past. As such, it might be useful to reflect on Jesse Shera's oft-quoted definition of a library: "To bring together human beings and recorded knowledge in as fruitful a relationship as is humanly possible" (in Dysart & Jones, 1995, p. 16). Digital library proponents must consider the role of people (i.e., as users and service providers) if the digital library is to be truly beneficial. Technology and information resources on their own cannot make up an effective digital library.

While a good deal of the literature on digital libraries emphasizes technology and resources at the expense of the service perspective, a number of authors and researchers have considered human interaction in the digital library environment. A number of studies at Lancaster University (Twidale, 1995, 1996; Twidale, Nichols, & Paice, 1996; Crabtree, Twidale, O'Brien, & Nichols, 1997; Nichols, Twidale, & Paice, 1997) have considered the importance of human interaction in the digital library. These studies focus on the social interactions of library users with librarians, librarians with librarians, and users with other users. By studying these

collaborations in physical library settings, the authors have drawn some general conclusions that might be applied to digital library design:

- Collaboration between users, and between users and system personnel, is a significant element of searching in current information systems.
- The development of electronic libraries threatens existing forms of collaboration but also offers opportunities for new forms of collaboration.
- The sharing of both the search *product* and the search *process* are important for collaborative activities (including the education of searchers).
- There exists great potential for improving search effectiveness through the re-use of previous searches; this is one mechanism for adding value to existing databases.
- Browsing is not restricted to browsing for inanimate objects; browsing for people is also possible and could be a valuable source of information.
- Searchers of databases need externalized help to reduce their cognitive load during the search process. This can be provided both by traditional paper-based technology and through computerized systems (Twidale et al., 1996).

In a paper presented at the Digital Libraries '94 Conference, Ackerman (1994) stresses that, while the concept of the digital library "includes solving many of the technical and logistical issues in current libraries and information seeking," it would be a mistake to consider solely the mechanical aspects of the library while ignoring the "useful social interactions in information seeking." Ackerman outlines four ways in which social interaction can be helpful in the information-seeking process:

1. One may need to consult another person in order to know what to know (help in selecting information).
2. One may need to consult a person to obtain information that is transitory in nature and as such is unindexed (seeking informal information).
3. One may need to consult others for assistance in obtaining/understanding information that is highly contextual in nature rather than merely obtaining the information in a textual format (information seekers often have highly specific needs and interests).
4. Libraries serve important social functions, e.g., students and/or faculty meeting each other in hallways, study areas, etc. (socializing function).

Ackerman notes that these points "all argue for the inclusion of some form of social interaction within the digital library. Such interaction should include not only librarians (or some human helper), but other users as well."

In a paper for the Digital Libraries '96 Conference, Brewer, Ding, Hahn, and Komlodi (1996) argue that intermediary services should play a

crucial and essential role in the ongoing development of digital libraries so as not to limit the digital library to the role of "passive warehousing." The authors identify three major purposes for intermediation in the digital library environment:

1. Interaction with potential information beneficiaries. (A beneficiary is defined as "any entity acting as an information seeking agent" and can include users, organizations, and software).
2. Interaction with information resources.
3. Mediation between information resources and users to add value during the information transfer process. (Value added services can include "searching, categorization, filtering, translation, publishing, or some combinations of these activities.")

While the authors do not focus solely on human intermediaries (indeed, a great deal of the discussion focuses on software intermediaries), they do make a very strong case for the necessity of intermediaries in the digital library environment and call into question the notion of a digital library as a passive warehouse. Noting that intermediation services "will be crucial to the development of effective digital libraries," the authors establish the importance of value-added services to the digital library.

Matson and Bonski (1997), Hathorn (1997), Ferguson and Bunge (1997), Rapple (1997), and Abbas (1997) directly address the question of whether digital libraries will need librarians. Ferguson and Bunge (1997) quote David Pescovitz as saying (in a *Wired* article) "no software application will replace a good reference librarian any time soon" (p. 252). Matson and Bonski's (1997) article is titled "Do Digital Libraries Need Librarians?" and Hathorn's (1997) piece is titled "The Librarian is Dead, Long Live the Librarian."

Matson and Bonski (1997) discuss the development of the National Drug Intelligence Center within the U.S. Department of Justice. Based on these experiences, they outline three roles that have been proposed for the librarian in the digital age:

1. the librarian as enhanced service provider in a proactive manner;
2. the librarian as guru of copyright, licensing, and electronic redistribution—i.e., the understanding of what users and organizations actually want to do with information; and
3. the librarian as system interface designer, making use of experience with how library users request, use, and process information.

Hathorn (1997), in an opinion-editorial piece, contends that librarians will have a place in the networked future and discusses two models for the future role of librarians: the "Redundancy Model" (where librarians will no longer be needed since anyone will be able to access information directly) and the "Masters of the Universe Model" (where no one will be

able to acquire any *useful* information without the intermediary services of the librarian). After interviewing a number of practicing librarians and library educators, Hathorn (1997) opines that the reality will be found somewhere between the two extremes.

Rapple (1997) identifies a number of roles that academic librarians of the future must assume, such as fostering partnerships, providing outreach to students, supporting academic disciplines, and teaching and facilitating information access. In concluding, he notes that "librarians have a strong future in the networked environment...the experience and expertise of librarians will be invaluable for helping in the design of requisite software and hardware and, above all, for mediating—electronically and at a distance—between the information and the user." Their traditional role of assisting and instructing users will continue as, seeking to forestall user alienation, they endeavor to put a human face on information technology.

Abbas (1997) summarizes a number of roles that others have identified for future librarians:

• librarians as gateways to the future and to the past;
• librarians as teachers;
• librarians as knowledge managers/workers;
• librarians as organizers of networked resources;
• librarians as advocates for information policy development;
• librarians as community partners;
• librarians as "sifters" of information resources;
• librarians as collaborators with technology resource providers;
• librarians as technicians; and
• librarians as individual information consultants.

In the last role mentioned, Abbas (1997) touches on some parallel points made by other authors. Vannevar Bush (1998), in "As We May Think," discusses a world of information overload, a world where "even the modern great library is not generally consulted; it is nibbled at by a few". Bush describes a world of increasingly privatized information spaces, a world enabled by his Memex, a world very similar in basic respects to the current/coming networked world of information. While the information may not be stored in everyone's desk, as Bush envisioned, and instead may be stored in a distributed fashion across the network, the methods of access will continue to involve more privatized and solitary scenarios. In his Memex scenario, Bush (1945) does see a new profession opening up that is strikingly similar to what some others have forecast for the role of the future librarian as individual information consultant: "There is a new profession of trailblazers, those who find delight in the task of establishing useful trails through the enormous mass of the common record." Bush did not appear to be fond of libraries, noting that "our ineptitude in get-

ting at the record is largely caused by the artificiality of systems of index-ing." While his image of the "profession of trailblazers" did not seem to include librarians, his description of the "trailblazer" seems to very closely parallel the roles that many librarians are assuming as access to informa-tion becomes more and more privatized.

Miksa (1996) arrives at much the same conclusion, albeit coming from a slightly different direction. Miksa contends that the modern library is an era-specific phenomenon. The privately held libraries of the past gave way to the publicly held library in the mid-nineteenth century through a combination of economic and social forces. Miksa contends that those forces are shifting and, in doing so, the library will once again be rede-fined. As access to great quantities of networked information becomes more affordable to more people, Miksa sees the information space once again becoming privatized. He contends that the contribution of the modern library is not so much a physical institution as it is an idea or concept, "that making available to the members of a society the widest possible array of information bearing entities and doing so in a value-added but efficient way with respect to the selection, organization, and delivery of those entities, and with respect to aiding in their use, is abso-lutely necessary for the society's survival." While Miksa sees the central-ized physical library gradually fading into the background and being re-placed by the privatized information space, he also sees a role for future librarians as "enablers." Miksa (1996) sees the role of the enabler as "a person who can help others create their own personal space libraries, or families make their own family-space library systems with individual modes for family members, or businesses any one or more necessary personal-ized information systems." He also sees the enablers developing filtering agents and becoming publishers of information. He equates librarianship to the writing profession. "While once there were scribes who did all the writing, the ability to write has now spread through society. . .but there are still those who make their living as writers." He notes, "even though such library creating skills will spread throughout society, so also will specially educated and skilled people who can create such libraries not only be needed but will become very important."

Reference Services in the Digital Library
As noted previously, many writers have indicated that librarians will continue to have a role in the future of networked information. That future will involve collaborating with users and information seekers, play-ing an intermediary role, and providing value-added information services, much as librarians do in the physical library setting. In U.S. libraries, the great majority of such collaboration between users and professional librarians is in the reference setting. Reference librarians guide users through an often overwhelming myriad of information resources in both

print and electronic format. Reference librarians frequently play a major instructional role, teaching users to be better able to navigate through the maze of information resources. Reference librarians also offer value-added services, producing instructional materials and written guides to information resources. Because reference librarians have for so long played such roles, this author decided to focus on the concept of reference services in the digital library. The majority of collaborative activities in the digital library will most probably center on the various activities in which reference librarians engage. Indeed, Eli Noam (1997), a Columbia University professor of Finance and Economics, in an essay entitled "Electronics and the Future of the Research Library," notes that "in the past, the library offered a platform for several complementary academic functions—information base, research environment, reference service, and community center. The latter two are likely to become more prominent as the former two functions will decline."

In this section, I will begin profiling a number of experimental projects that have attempted, in one way or another, to test the extension of traditional reference services into the electronic environment. I will also highlight a number of electronic mail reference services to examine how the physical libraries of today are actually moving their services out into the networked world.

By and large, experiments with extending reference services into the digital environment have centered on two electronic media: e-mail and/or video. Electronic reference services in production in today's libraries generally focus on the use of e-mail, most commonly with some sort of World Wide Web interface. Some libraries have experimented with video but generally also have involved text-based services such as e-mail.

The "See You See a Librarian" project (Morgan, 1996) was conducted during Summer 1996 with the primary goal being "to discover whether or not video conferencing technology...could be used in libraries to enhance information/knowledge services." The project was somewhat unique among experiments at delivering services electronically in that it was not limited to a single institution—i.e., participants ranged across institutional boundaries. As an aside, this multi-institutional aspect raises an interesting question: As library services become more networked and co-location becomes less of a requirement, will it become more conceivable that some library services might be outsourced? Noam (1997) hints at this when he suggests that universities in the future might be administered remotely and by specialized subcontractors, adding that "library collections will be offered and managed from a distance by specialist firms." Is it feasible to think that a centralized site at a major institution might be able to provide, at a fee, some degree of services (including electronic reference) to other institutions? In a sense, it could be considered as a natural exten-

sion of library resource sharing—sharing human resources in this case. Regardless of how effective librarians would find such a scenario, it is probably only a matter of time until funding agencies and higher education administrators stumble across the concept as yet one more opportunity for cost-cutting made possible through technology.

The "See you See a Librarian" project title was derived from its use of the CU-SeeMe software for videoconferencing and was broken down into three phases:

1. **Feasibility.** The purpose of this phase was basically to determine if there was sufficient critical mass among libraries and librarians in the availability of the hardware and software required to provide video-based information services.
2. **Librarians on Librarianship.** This phase would involve librarians engaging in discussions with each other for "real time discussions of library issues."
3. **Librarians Fostering Knowledge.** If, from the first phase, it turned out that there was a critical mass of hardware and software, and from phase two, a critical mass of librarians willing to participate, this phase would involve opening up the discussion to "information seekers needing assistance."

In summary, the first phase met with some success, with over 300 connections established, with multi-institutional and international participation. But it was determined that the hardware and software resources in libraries were insufficient to reach a critical mass of participants. The scope of the second phase was narrowed to facilitating a real time debate between two librarians on a topic of interest with an audience of passive lurkers using two CU-SeeMe reflectors. Through a listserv, six people were identified who were both articulate and were willing to participate in the debate. Interestingly, none of these six people had access to the applicable video facilities required to conduct a videoconferenced debate. The third phase was conducted on a very limited basis. Morgan (1996) calls the experiment a qualified success and largely pinpoints the lack of a critical mass of qualified librarians with access to the necessary hardware and software, even though the costs of the hardware (inexpensive video cameras) and software (CU-SeeMe is shareware) were relatively minimal.

In another experiment, Sugimoto, Gotou, Zhao, Sakaguchi, and Tabata (1997) tested a collaboration support system (CSS) based on the "librarian's desk" metaphor. The CSS utilized video, a telephone connection, a shared virtual display, a virtual whiteboard, and an image tool. The researchers tested users' interactions with CSS and instruction on the library's OPAC with a control group receiving face-to-face instruction on using the OPAC. The researchers characterized response to the CSS system

as "mostly positive," but the results seem somewhat inconclusive with the face-to-face group requiring less instruction time than the CSS group. The experimenters blamed the lack of conclusive results on the low quality of the video equipment used in the experiment, noting that "these problems can be solved in future high performance network and computers." But it would seem that further experimentation with the CSS application would be required before one could be sure that the only problem was inadequate technology.

In experimentation at the University of Michigan's Shapiro Undergraduate Library (Folger, 1997), in conjunction with the university's residence hall libraries, librarians conducted trials of providing reference services between the library and residence halls using desktop videoconferencing technologies. The Interactive Reference Assistance (IRA) project began in Fall 1995 and lasted through the 1995-1996 academic year using CU-SeeMe technology and inexpensive video cameras. A significant amount of time was invested in planning and implementation activities, including publicizing the IRA service through the distribution of flyers in the residence halls and advertisements on the campus television system and in local print media outlets. IRA service was offered two evenings a week for two-hour sessions each evening. A librarian in the Shapiro Library would open a CU-SeeMe session with a workstation in the residence hall and monitor the connection to see if anyone was requesting service. Face-to-face reference encounters in the Shapiro library were given priority over video services to the residence hall. The project was well-planned, was based on a good collaborative working relationship between the Shapiro Undergraduate Library and the UM residence halls, and the librarians participating in the project were characterized as being "enthusiastic about the potential of the technology," all in all a seemingly good recipe for a successful project. But, during the two-semester duration of the project, "fewer than twenty students actually asked reference questions" using the video connection to the Shapiro Library. What were the reasons offered for the relative lack of success of this project?

- One significant problem was mentioned: "the inconsistent quality of the audio and video" connections. Researchers determined that there was insufficient bandwidth in the implementation to provide necessary levels of service.
- Another problem cited was lack of adequate technical support for the CU-SeeMe shareware product.
- Librarians also noted that it would have been helpful for librarians and users to be able to see each others' screen displays. They noted that "being unable to see and point to the screen. . .made it difficult to effectively teach the students how to use the library's resources."

- It was also noted that some students and staff members reported being self-conscious while on camera.

Despite the relatively low levels of use during the 1995-1996 academic year, the Shapiro Library continues to work with providing reference services via video. Acting on the hardware, network, and software problems report in the pilot, the library has been investing in newer cameras and a commercial software package and has been discussing collaboration with the university's computer center to improve the quality of video transmission. The project has also raised interest levels in other libraries on the UM campus with several exploring the possibility of offering interactive video reference services.

The Interactive Reference Service (IRS) at the University of California, Irvine (UCI) is another project intended to test the effectiveness of interactive video reference service (Lessick, Kjaer, & Clancy, 1997). The project involves a videoconference link between librarians at the reference desk at the university's science library and students working one-half mile away in a college of medicine computer lab. The service is offered one hour per day, Monday through Friday. The science library undertook the project for a number of reasons:

- The UCI library has a goal of developing a virtual library by 1999, and electronic services are a part of this goal.
- Videoconferencing technology has the potential to meet the users' needs without requiring them to physically come to the library, an important aspect of the virtual library.
- Library staff found little concrete data on the effectiveness of using videoconferencing to deliver remote library services and wished to generate data on such services.
- The UCI library had already made a significant investment in the development of a technology-rich infrastructure, and so the project could be undertaken without incurring significant additional costs.
- Science library staff had been physically distanced from medical students with the move of biomedical support services away from the medical school in 1994. Librarians had been looking for a way to re-establish effective services to medical students.

UCI Science Library staff ran a preliminary pilot within the library to test the effectiveness of the proposed IRS project. Participants in the pilot program would focus on the following points:

- reliability of the technology;
- quality of video and sound communications;
- the effectiveness of conducting reference interviews between sites;
- whether the service was actually *helping* users with their research needs;
- whether the service increased effectiveness over standard telephone reference service (an important consideration);

- document staff reactions, as well as technical and service issues; and
- determine how service could be integrated into daily workflow *without* requiring reference staffing increases.

Based on the results of the pilot study, UCI librarians began to plan for the implementation of the IRS service itself. Planning considerations included staffing needs, integration of IRS into the standard reference activities of the science library, and promotion and publicity. The project utilized the Apple VideoPhone Kit, which includes an audio/video connection, a chat window, and a whiteboard (which can be used to display graphic images including Web pages). A sample screen from an IRS session can be seen at <http://www.ala.org/acrl/paperhtm/irs4.gif>.

   After three months of experimenting, the librarians arrived at several conclusions:

- The students appreciated not having to go to the library for these services; they appreciated the outreach.
- The students suggested that the IRS reference videoconferencing workstations be placed in a dedicated room to avoid disturbing other computer lab users.
- While the students appreciated the remote services, they did not like having to go to the library to retrieve needed materials.
- Librarians wanted technical improvements such as larger monitors (to make it easier to accommodate multiple windows); an audio cue to alert them to the presence of someone with a question; a headset microphone.
- After initial self-consciousness is overcome, people like to be able to see the person at the other end of the conversation.
- Desktop videoconferencing has advantages over telephone reference service, especially with the chat and whiteboard facilities.

   While videoconferencing promises a great deal in moving reference services from the library out to the user, most remote electronic reference services in operation today are based on electronic mail. Three particular studies (Abels, 1996; Hahn, 1998; Bushallow-Wilber, DeVinney, & Whitcomb, 1996) provide interesting perspectives on the use of e-mail to provide library reference services to users.

   Abels (1996) discusses the differences between reference interviews via electronic mail and reference interviews using other media. Over the course of three semesters, from Fall 1993 through Fall 1994, graduate students in the University of Maryland's College of Library and Information Science studied online reference in connection with a course on that topic. In the Fall 1993 semester, the students' client base was drawn from participants in a graduate class at the Palmer School of Library and Information Science at Long Island University. During the second phase in the Spring 1994 semester, the client base consisted of "real clients"—i.e.,

faculty and graduate students at Maryland. The client base was drawn from the same pool for the third and final semester (Spring 1994). During the Spring 1994 semester, the students used a "remote reference request form" that could be submitted via e-mail, fax, or regular mail. The clients could choose which form of communication they wished to use. E-mail reference interviews were analyzed based on certain parameters— i.e., interview analysis, message counts, subject and motivation, media used, and student critiques. In analyzing the results, Abels (1996) concludes "on the basis of this project, it is clear that some substantive reference questions can be negotiated successfully via e-mail" (p. 355). While the results were positive, Abels also cautions that further research is needed to see how well e-mail reference works in a real-life setting and where client deadlines, face-to-face reference services, institutional priorities, etc., might compete with the provision of e-mail reference services.

In addition to studying the effectiveness of e-mail reference, Abels also used the study to formulate a model e-mail reference interview. During the Fall 1993 semester, students were not given any guidelines concerning how to conduct reference interviews. It was up to each student to develop an interview strategy. Abels reports that five different interview approaches were used by students:

1. **Piecemeal.** Students asked questions as they occurred to them. The characteristics of e-mail communication seemed to lend themselves to this approach, as it was easy to dash off quick questions or responses to clients without thinking them through.
2. **Feedback.** The characteristics of the medium allowed students to go back and forth between the various stages of the reference interview process.
3. **Bombardment.** Students would string together a series of different questions in one e-mail message, sometimes confusing or frustrating clients.
4. **Assumption.** Students would make assumptions about the nature of the client's information need. Abels (1996) notes that this is not uncommon in any interview process, but the potential with e-mail for longer delays between questions and answers suggests that this approach "is more likely to be used in the e-mail reference interview" (p. 350).
5. **Systematic.** Students used this approach when the client sent an unstructured question. The student would respond in a manner that organized the interview in a structured way. Often students would structure their responses by creating something that resembled forms sometimes used for face-to-face reference interviews.

The results of the first phase of the project suggested that this last approach had the most potential for the e-mail reference interview, as it

forced clients to submit questions using a structured format and to provide information up front that would be useful to the students. This led the students to design a remote reference request form during the second phase of the project. The form designed by the students had three basic sections:

1. **Personal Data.** Information that identifies the client as well as "organization-specific personal information" such as faculty/student/staff status, etc. This section of the form also allowed the client to stipulate the mode in which they preferred to be contacted—i.e., e-mail, face-to-face, telephone, or mail.
2. **Subject Data.** Information that would allow the student to begin formulating search strategies. This information was further subdivided to gain the following information: a description of the subject, the purpose of the request, and relevant resources of which the client is already aware.
3. **Constraints on the Search Process.** This section of the form asked about external constraints (e.g., deadlines, budget, and so on) and constraints involving the information to be presented to the client (e.g., how many references or citations, required format for the references, and so on). This section of the form also asked the client in which format they wished the information to be delivered (e.g., e-mail, regular mail, pick up in person, and so on). Interestingly, Abels indicates that there are some constraints that are not as easy to determine via e-mail as they are in a face-to-face interview—e.g., educational level of the client, reading level, motivational level, and so on.

Finally, Abels uses an analysis of the study to create a model remote reference interview consisting of the following stages:

* **Introduction and Problem Statement.** The client fills in the remote reference request form.
* **Question Negotiation.** This stage is only invoked by the librarian if the original problem statement needs further clarification.
* **Summary.** The librarian prepares a summary of the information need and outlines the characteristics of the required answer.
* **Feedback.** The librarian sends preliminary or final results of the search. The client can let the librarian know if the information need has been met via return e-mail.

Abels (1996) notes that these stages are very similar to the stages in a face-to-face reference interview. She estimates that an e-mail reference interview can consist of as little as three messages: "the problem statement by the client, summarization by the intermediary, confirmation by the client" (p. 354), although it would seem that a very simple query could be handled in two messages—i.e., problem statement and confirmation.

Abels contends that the summary stage "should always be presented in a remote reference interview" (p. 354), but one could argue that in very simple cases this may not be necessary.

Another study by Hahn (1998) "used content analysis of service logs and interviews with staff and users of a successful service to identify. . .impacts of the communication medium on service provision." Interestingly, while the organization Hahn studied lies within an unnamed library, it offers fairly limited services of a technical help desk nature, answering questions related to network use and communications software. The study poses four research questions:

1. **What is the content of staff and user messages?** Staff generally favored an extended dialogue of back-and-forth messages, while users favored a more direct question-and-answer exchange. Staff tended to think of the exchanges as solutions in response to stated problems, while users tended to think of the exchanges as question-and-answer.
2. **What do participants perceive as the benefits and limitations of using the medium for the type of service provided?** Benefits were viewed from two perspectives: institutional benefits and user benefits. Staff and users saw increased efficiency as the chief institutional benefit and saw improved convenience as the primary user benefit. Both staff and users saw "system vulnerability" (i.e., the e-mail system was undergoing a period of instability during the study) as the chief limitation. Beyond that, both staff and users saw "high dialogue penalties" (i.e., the decreasing usefulness of extended dialogues) as a major limitation.
3. **What problems are created by using electronic mail as the medium for providing a question answering service?** Staff and users both agreed that missing or incomplete information was the biggest problem. Users sometimes omitted information that was essential to answering a query, and staff sometimes omitted essential information in answering queries.
4. **How do participants cope with problems created by the nature of service delivery through e-mail?** Staff and users tended to cope with the "missing information" problem by extending the back-and-forth dialogue. Sometimes they coped by forging ahead without the missing information, although this was obviously not desirable.

Hahn (1998) concludes that there are both limitations and benefits to e-mail reference service. The limitations include "lost time between messages, loss of message richness, and system instability," while the benefits include expanded access to the service, greater convenience for users, and enhanced efficiency for staff due to the asynchronous nature of the medium. Hahn ends by noting: "Whatever drawbacks or frustrations participants may experience, the high use of the service suggests that further development will continue."

In a study conducted in the University Libraries at the State University of New York at Buffalo, Bushallow-Wilber, DeVinney, and Whitcomb studied logs of e-mail reference service offered through the university's undergraduate library. Each transaction from an eighteen month period (January 1993 through June 1994) was studied. Questionnaires were distributed via e-mail with follow-up questions to non-respondents sent by U. S. mail. Research questions included:

- **Who uses e-mail reference?** Graduate students accounted for 44 percent of the activity followed by faculty with 35 percent. Undergraduate use was very low at just 6 percent. As for departmental affiliations, users from the engineering department accounted for 29 percent of the activity, with natural sciences next at 21 percent, with social sciences following up with 16 percent. Males accounted for 75 percent of use while females accounted for 25 percent. About one-third (32 percent) of e-mail reference users submitted multiple questions ranging from two to twelve questions.

- **What types of questions are asked?** Of the reference questions asked, almost three-fourths (74 percent) were handled "using standard reference tools." The remainder were questions regarding library services and policies (12 percent), the use of the library's OPAC (7 percent), and suggestions for book or journal purchases (7 percent). In other words, the questions received bore a strong resemblance to the questions received at the library's reference desk. This suggestion (that remote reference activity is similar to face-to-face reference activity) should be tempered, however, by at least one author's suggestions that the nature of remote access to library systems differs from access to the same systems from within the library (Sloan, 1986, 1991).

- **When are questions transmitted?** As might be expected, the peaks and valleys of monthly usage closely paralleled the university's calendar. Most questions were asked on weekdays, with peak days occurring on Wednesdays. A large number (90 percent) were submitted during hours that the reference desk was open, with most coming between 10:00 A.M. and 5:00 P.M.

- **From where are they transmitted?** Most respondents (65 percent) indicated having initiated a question from a campus office. Nearly half (48 percent) reported having transmitted a question from home. Almost one-third (30 percent) had initiated a question from a computer lab. (Percentages add up to greater than 100 percent because a number of respondents asked more than one question.)

- **Do e-mail reference users prefer that medium over others?** A majority of respondents (58 percent) ranked e-mail as their preferred medium. Over one-third (37 percent) preferred face-to-face encounters, only 5 percent preferred the telephone, and none of the respondents preferred using the U.S. mail.

While one can gain helpful information concerning e-mail reference services by reviewing published studies, it is also helpful to look at the e-mail reference services actually being offered by libraries. The following Web sites provide representative samples of electronic reference forms from fifteen college and university libraries:

- Babson College
  http://domino.babson.edu/WEBforms.nsf/
  Library_Reference_Question?OpenForm
- Ball State University
  http://lib.bsu.edu/refnet2.html
- Brown University
  http://www.brown.edu/Facilities/University_Library/forms/
  AskReference.html
- Dakota State University
  http://www.dsu.edu/departments/library/asklib.html
- DePaul University
  http://www.lib.depaul.edu/dpu/reference/emform.html
- Embry-Riddle Aeronautical University
  http://amelia.db.erau.edu/Reference/email_requests.html
- Indiana University
  http://www.indiana.edu/~libweb/question.html
- Ohio University
  http://www.library.ohiou.edu/forms/aldenref.html
- University of Alberta
  http://www.library.ualberta.ca/library_html/reference/hss-
  email.html
- University of California, Irvine
  http://sun3.lib.uci.edu/~slriweb/rqform.htm
- University of Illinois at Chicago
  http://www.uic.edu/depts/lib/libmail/cgi-bin/reference.html
- University of Illinois at Springfield
  http://www.uis.edu:1967/~library/ask.html
- University of Illinois at Urbana-Champaign
  http://www.library.uiuc.edu/rex/reflib.htm
- University of Iowa
  http://www2.arcade.uiowa.edu/commons/e-ref.html
- University of Southern Mississippi
  http://www.lib.usm.edu/ref.html

These examples of Web-based e-mail reference forms run the gamut from very simple (e.g., Dakota State University) to very comprehensive (e.g., Babson College). Many do not explicitly call for information that Abels (1996) identified as important in the model remote reference form developed by the LIS students at Maryland. The Dakota State University

Web form (http://www.dsu.edu/departments/library/asklib.html), for example, involves a simple pop-up e-mail form pre-addressed to the reference librarian's personal e-mail account. The form requires no personal data (other than the e-mail address of the sender, which is system-supplied anyway), besides a written statement asking the sender to indicate whether he or she is affiliated with the university. The user has no guidelines about entering the subject data of the request, and there is not a hint that any information on search constraints might be helpful. In other words, it is a form that almost requires a follow-up clarification by default. One might suppose that the simplicity of the form might stem from the fact that DSU is a relatively small university. But this same basic format is echoed at some larger comprehensive universities. Indiana University's (IU) form (http://www.indiana.edu/~libweb/question.html) has more in the way of textual information, but even that is fairly basic. The user at IU merely types in the return e-mail address and then the question. Once again, this does not meet the basic criteria of Abels's remote reference form. The three University of Illinois campus libraries do not require much more. UI-Chicago (http://www.uic.edu/depts/lib/libmail/cgi-bin/reference.html), for example, simply requires the return e-mail address and the question. UI-Springfield (http://www.uis.edu:1967/~library/ask.html) requires name, return e-mail address, academic program, and question. UI-Urbana-Champaign (http://www.library.uiuc.edu/rex/reflib.htm) asks for name, e-mail address, phone number, and question. One positive benefit of this minimalist approach might be that the user is not required to invest much effort in getting the process started.

Some libraries require more complete information beyond simple identification and asking the question—e.g., Ball State University (http://lib.bsu.edu/refnet2.html) asks the user to indicate sources he or she has already consulted, which prevents the searcher from reinventing the wheel to a certain extent. Embry-Riddle Aeronautical University (http://amelia.db.erau.edu/Reference/email_requests.html) asks the user to indicate "keywords, significant terms, phrases, synonyms, etc., that describe your topic" in addition to asking for sources already consulted.

Babson College (http://domino.babson.edu/WEBforms.nsf/Library_Reference_Question?OpenForm) presents the user with by far and away the most comprehensive form. This form begins by requesting basic information found on other libraries' forms—e.g., name and e-mail address. But the Babson form goes well beyond these basics in establishing the user's personal profile. The form offers the user a choice of four affiliation statuses: undergrad, MBA student, faculty/staff, or alumni. The form offers the user the option of having the library contact them by e-mail or by telephone and asks for a "good time to reach you." The form also asks the user to enter information on the course for which the information is needed (course name, professor's name, whether or not it is a

group project, and the number of persons in the group). The form also requests substantial information regarding subject data, the second element of Abels's (1996) model form. While the course name is an important element of subject data, the user is also asked to state the "subject area of the question," picking from a list of potential areas. The form also has a space for the user to supply keywords, significant terms, synonyms, and so on, regarding the subject, as well as a space to indicate sources that the user has already consulted. The Babson form also gathers information regarding constraints on the search process, the third element of the model form that Abels describes. Users can indicate a "not needed after" date as well as the due date for the course project for which the information is needed. The form asks for additional information regarding constraints, including the "level of information needed" (basic or advanced) and the "type of answer preferred" (brief factual answer to the question or "ideas for sources to consult for exploration") (there is also a space for the question itself). While the more comprehensive form at Babson provides the reference librarian with the information required to make the remote reference process that much more efficient (e.g., it more closely parallels the questions that might be asked during a face-to-face reference interview), the complexity of the form might be off-putting to some students. But the extra work required by the user in filling out the form also has benefits for the user. While the initiation of the remote reference process may be more complex for a user at Babson than, say, a user at Dakota State University, providing the more complete information up front most likely will result in a more effective electronic transaction overall.

REMOTE REFERENCE SERVICES: A MODEL

In a review of electronic reference services, this author reviewed both video and e-mail based services. Each has its own advantages. Among other things, video (especially when done with the proper technological infrastructure) has the benefits of greater media richness and immediacy of interaction due to its synchronous nature. E-mail has the benefits of having a broader base of potential users (due to the more widespread use of e-mail on college and university campuses) and greater convenience in terms of service hours due to its asynchronous nature.

In a sense, one could make the case that e-mail and video-based remote reference services are complementary rather than an either/or scenario. E-mail, at least for the foreseeable future, has the benefit of more complete penetration of the user base, quite frequently all the way to the users' desktops, whether the users are in labs, offices, dormitories, homes, or even while traveling. E-mail also apparently does not require as significant an investment in additional reference personnel, as there is not a direct demand on a librarian's time, and questions can be handled on an "as available" basis or even distributed to other library personnel.

In even the most enthusiastic settings, video-based reference services have only been offered for one or two hours a day at most, as reference staff have to be dedicated to the task and tied down to a video-equipped workstation for the duration of the service hours (Lessick et al., 1997). In contrast, many libraries have been able to at least initially implement e-mail-based reference services without necessarily requiring increases in reference staffing. But those (users and librarians alike) with experience with offering reference services via videoconferencing are enthusiastic about the experience. Video reference services appear to come much closer to emulating the ambiance of face-to-face reference services than does e-mail reference.

   One comprehensive model for remote reference services for a college or university would offer a scenario where video reference services were offered on a limited scheduled basis, and e-mail reference services were offered on a campus-wide on-demand basis. Due to its staff-intensive nature, video-reference services would be controlled by limiting the number of sites from which such sessions could be initiated. Working with the campus computing center, the library could identify computer labs or remote computer center sites that are equipped for such services or that could be equipped with minimal investment. The key here is to build on existing campus and library technical infrastructures, and to implement such services in locations where basic technical capabilities are at a sufficient level where they do not interfere with service provision (Sugimoto et al., 1995; Folger, 1997; Lessick et al., 1997).

   Again, due to the staff-intensive nature, video reference services would be controlled additionally by requiring that they be scheduled. This allows the library to control staff scheduling and to ensure the staff is used more effectively rather than simply sitting by a video workstation waiting for a user to initiate a session. Researchers, such as Folger (1997), have pointed out this ineffective use of staff time. Scheduling these video reference sessions could be done using a Web-based form similar to the form that the University of California, Irvine, uses to schedule research consultations (http://sun3.lib.uci.edu/~slriweb/rqform.htm). In addition to allowing for more efficient scheduling, the use of such a form would also allow the librarian to do some advance preparation by getting some personal data and subject data in advance. With the addition of some information on search constraints, the librarian would be prepared in advance with data for the three elements of Abels's (1996) model form.

1. The format of the video reference service would be similar to the Apple VideoPhone Kit-based service used successfully at the University of California, Irvine (http://sun3.lib.uci.edu/~slriweb/rqform.htm). The user schedules a session with a librarian, goes to one of the authorized remote sites at the appointed time, and opens the session. The

librarian will be waiting and will be prepared to deal with the specific user and the specific request. The librarian will begin the session and use the stages of Abels's (1996) model remote reference interview, as applicable (depending on the nature of the request, some of the stages may have been fulfilled when the user completed the scheduling form).
2. There is a probability that the user's information needs may not be completely met. The user and the librarian can decide during the session whether another video session might be scheduled or whether the session might best be handled by switching to another medium— e.g., e-mail.
3. Finally, while access to the video reference service might be offered from limited specific locations initially, the library should always be alert to opportunities to expanding such access points, as enabled by improvements to the users' technical infrastructure. The ultimate goal would be, of course, to offer such services to every user's desktop, but the implementation of such an ideal must be tempered by the realization that video reference is a labor and time-intensive service. Even as access points are broadened, the concept of scheduling sessions in advance should probably be retained.

Unlike the video reference model, e-mail reference services would have fewer restrictions. The basic restrictions that would need to be built in would be the average-time-to-answer (e.g., telling the user that the service answers questions within forty-eight hours), limiting the service to users affiliated with the institution, and possibly a limit to the types of questions that will be answered (e.g., quick factual answers as opposed to having the librarian do someone's term paper research for them). Another obvious limitation is that the user must have access to e-mail. Beyond that, e-mail reference services would not limit the user to any set location, and the service would not require any scheduling. The user and librarian could collaborate asynchronously, with a user, for example, submitting a question at home in the middle of the night and the librarian preparing a response the next day.

The e-mail reference model would involve the use of a Web-based e-mail reference form. This form would include the critical elements present in Abels' (1996) model reference form: personal data, subject data, and constraints on the search process. The form would be based on the model used at Babson College (http://domino.babson.edu/ WEBforms.nsf/Library_Reference_Question?OpenForm). While some might complain that the Babson form is too complex and will put off some users, the reference process as a whole should, in the end, be more efficient than with a simple request form with its attendant need for back and forth messages to clarify the initial request. Some elements would need to be added to such a form to incorporate the limitations listed above—

e.g., an explicit statement that the service is only for those affiliated with the institution, and a statement near the top of the form that makes it clear how promptly a user's question will be answered. The second paragraph of the Ball State University form (http://lib.bsu.edu/refnet2.html) could serve as an example for how such a statement might be worded. It is important that a user's expectations of the service be based on reality, and that this reality be clearly stated. Hahn (1998), for example, notes in her study that users of the help desk were frustrated that the service was not more interactive when it was never intended to be. Explaining this aspect of the service initially can avoid such frustration.

The librarians could be assigned to handle incoming requests as they arrive, or they could check at set times during the day for e-mail requests (once again, see the Ball State model). This model would incorporate both approaches: librarians would be encouraged to pick up incoming requests within their subject responsibility on a time-available basis, but a supervisor would be charged with checking for new requests at prescribed times and assigning those requests to specific librarians. Librarians would have the option of referring these questions to other librarians (with their consent, of course). Larger libraries might consider allowing users the option of directing queries to specific departmental libraries, or even to specific reference librarians, with the understanding that these queries may be reassigned to others where applicable or necessary.

As indicated, the form will incorporate the elements outlined in Abels's (1996) model remote reference form. The reference librarians will incorporate the elements suggested in Abels's model remote reference interview (with some of these stages potentially handled in the initial submission of the remote reference form): introduction and problem statement, question negotiation (where clarification is required), summary, and feedback. Abels (1996), Bushallow-Wilber et al. (1996), and Hahn (1998) all note that a number of the problems associated with the e-mail interview are associated with the elapsed time of the process (between initiation of the request and the satisfactory reply to that query) as well as with the potential for too many back-and-forth messages ("high dialogue penalties"). The goal of the e-mail reference service should thus be to satisfy the user's information needs quickly and with a minimum of e-mail traffic. Abels (1996) considers three messages to be optimal: "the problem statement by the client, summarization by the intermediary, confirmation by the client" (p. 354).

E-mail reference staff would also have the option of suggesting a change in medium to the user. For example, the librarian might suggest a phone consultation or video reference interview for queries that do not readily lend themselves to written and/or asynchronous communication.

ASSESSMENT OF THE REMOTE REFERENCE SERVICE MODEL/SCENARIO

Jonathan Grudin (1994) cites eight "challenges" for developers of

collaborative systems. How does the proposed remote reference model/scenario stand up to these challenges?

1. **The disparity between who does the work and who gets the benefit.** At first glance, there seems to be a very disproportionate relationship between who does the work and who gets the benefit. Librarians do all (or most of) the work, and the users get all of the benefit. But by providing a comprehensive remote reference form such as the one used at Babson College and engaging the user in a model remote reference interview, the user is required to invest some time and effort in defining the information need, and the disparity becomes somewhat less pronounced. In cases where a library simply provides an e-mail address for reference requests, this disparity is more pronounced.

2. **Critical mass.** Critical mass is an obvious problem with respect to the video-based aspects of the model. The critical mass problem is not limited to simply developing a critical mass of users with videoconferencing hardware and software. There must also be a critical mass of users whose telecommunications infrastructure will support *effective* use of the video-based model. As indicated earlier, users are turned off by poor video transmission quality, and these first impressions may induce a negative attitude toward the video-based model. By restricting access to the video reference service to public service computing sites with sufficient infrastructure, the video reference model has a better chance of succeeding and building the positive experiences that will better enable future expansion. Critical mass is less of a problem for the e-mail-based portion of the model, as e-mail access is becoming more and more ubiquitous on college and university campuses. Another critical mass issue concerns the proportion of library users that also typically uses computer facilities. Rephrased, the question is: What good will it do to offer library services remotely if a critical mass of the people most likely to make use of those services does not readily make use of campus computer facilities? At least one researcher (Vander Meer, 1997) has investigated this concern and has determined that the findings of the study "provide substantial evidence that levels and frequency of computer use are positively related to library use." The final critical mass issue is user awareness. A system will not be effective until a critical mass of possible users is aware of the potential benefits of the service. In the remote reference service model proposed, the library would need to make considerable effort to publicize the service to potential users. Gradually, word-of-mouth publicity from satisfied users would take hold.

3. **Social, political, and motivational factors.** The biggest issue here would be motivating the librarians who would be providing the service. A well-organized service that attempts to balance the workload should

deal effectively with most negative associations librarians might have offering such a service.

4. **Exception handling in workgroups.** As the electronic reference interview process potentially involves much back-and-forth communications, exception handling would appear to be built into the process.

5. **Designing for infrequently used features.** The remote reference model would offer a fairly tightly defined service. At the same time, the flexibility of the reference interview would allow for relatively easy integration of infrequently demanded services.

6. **The underestimated difficulty of evaluating groupware.** The subjective nature of reference and information services, combined with the difficulty of evaluating such services when offered electronically, could prove to be a stumbling block. The evaluation of traditional face-to-face reference services is a tricky enough undertaking. The remote reference model should make every effort to incorporate elements that will assist in evaluation. E-mail reference, for example, lends itself to readily archiving each reference interview as it progresses. Apparently some libraries do this now, as the University of Alberta Web form (http://www.library.ualberta.ca/library_html/reference/hss-e-mail.html) contains the following "warning": "Any information that you submit may be retained for a period of up to a year so that the quality of this service may be monitored."

7. **The breakdown of intuitive decision making.** As Grudin (1995) notes, "decisions to develop unworkable applications are frequent." He also notes that "decision-makers are drawn to selectively benefit one subset of the user population: managers." The same sorts of parallels might be drawn concerning the remote reference services. Decisions might well be driven by library administrators or academic deans based on what they might read in "popular" higher education literature. Decisions must be driven by considerations for the users (students and faculty) and the service providers (librarians).

8. **Managing acceptance.** Grudin makes the point that implementation must be organized from the user's perspective rather than from the developer's perspective. Libraries developing remote reference services would be well advised to consider the perspective of the student or faculty member when designing the service. Too often, libraries seem to consider the librarian's perspective when designing services. The design of the remote reference service must first consider the viewpoint of the user (inasmuch as it makes sense) in order to be successful. Designing such a service from the librarian's perspective may well result in a system that faculty and students use infrequently.

Grudin and Palen (1995) also suggest that whether a collaborative system is mandated or discretionary may have an impact on the eventual

acceptance of that system. They state that effective systems that can be adopted on a discretionary basis are more likely to be accepted than those systems that are mandated by administrators. The proposed remote reference services can best be described as a hybrid approach. The service must be mandated from the service providers' (i.e., librarians') perspectives. Systems that are established informally on a discretionary basis by reference librarians face many potential problems—e.g., lack of support from the administration and the termination of the project when the interested librarian leaves the organization. By the same token, adoption by users must be purely discretionary (although it would be interesting to hear reactions from users if a library terminated face-to-face services in favor of offering remote reference services).

CONCLUSION

Obviously, library services have a role to play in the electronic/digital/virtual libraries of the future. Such services best manifest themselves along the lines of the remote reference services model. Library administrators and digital library developers alike would be remiss in not including the service aspect in plans and designs for digital library services.

The remote reference services model proposed in this discussion is an attempt to develop a service that combines video-based reference services with e-mail-based reference services in a manner that makes effective use of the advantages of both media. The model is based on observations made by researchers of video-based library services (Sugimoto et al., 1995; Folger, 1997; Lessick et al., 1997), and made by researchers of e-mail models (Abels, 1996; Bushallow-Wilber et al., 1996; Hahn, 1998), and by observations of dozens of e-mail reference forms currently in use in actual libraries (representative samples of which are found in the Web sites listed earlier).

I believe that the remote reference services model can be one significant step toward meeting the challenge outlined by Ferguson and Bunge (1997):

> 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 or need it.

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