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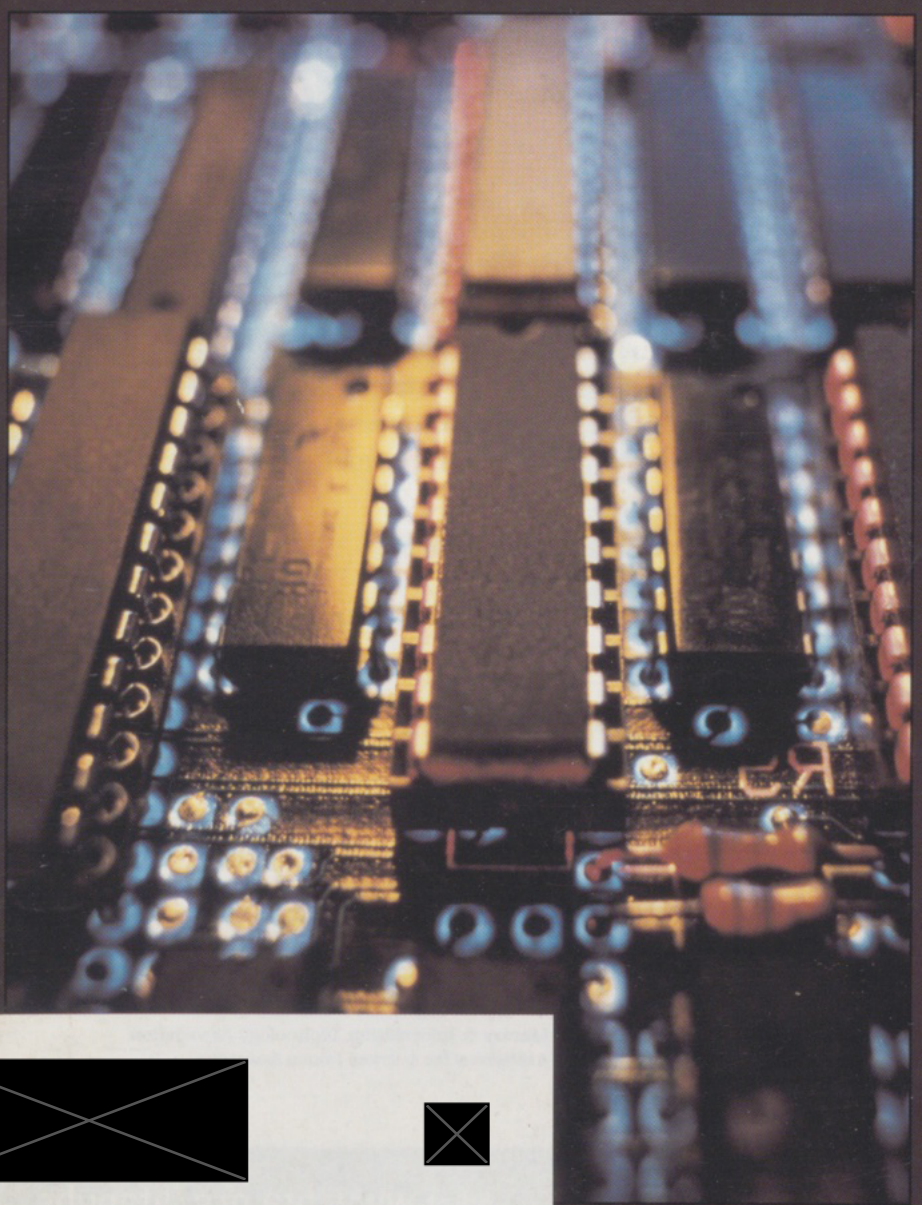

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- Web-Based Instruction

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Guest Editorial: Virtual Reference, Today and Tomorrow

Karen Ciccone

Since implementing a live online reference service in January, the North Carolina State University (NCSU) Libraries has been inundated with queries from librarians wanting to know how it's going. Clearly, virtual reference is currently a hot topic in libraries, with everyone moving their reference services online and looking to learn from others who have ventured into this new territory. At the same time, although we have just begun to experiment, we have been at it long enough to begin asking ourselves what works well, what we could be doing better, and what we would like to see in new virtual reference technologies. This issue provides readers with reports from pioneers of various online services, takes a look at problems yet to be solved, and attempts to imagine what virtual reference might be in the future.

Josh Boyer, Reference Librarian for Distance Learning at the NCSU Libraries, gives an overview of one academic library's solutions to the shared problems of staffing, choosing software, and getting used to online chat as a new mode of communication. Problems that still need to be resolved include how to best attend to multiple simultaneous live requests (from phone and chat), the need for expanded hours ("'9 to 5' won't cut it"), and well-thought-out policies for protecting the privacy of patron transcripts. Josh concludes with the claim that we need to reexamine the way our library Web sites and catalogs are designed. The virtual reference desk may help those patrons who are willing to use it, but we should optimize our virtual environment to give those who won't ask reference questions a better chance of helping themselves.

Temple University libraries, one of the early adopters of virtual reference technology, began its online chat service in November 1998. Sam Stormont's article describes the history of this project, including Temple's experiences using homegrown virtual reference software (developed by students in Temple's computer and information sciences department). He discusses their ongoing experiments with different staffing models and shares the results of their research into various software packages. The Temple service currently receives approximately twenty-five to thirty questions per week, about twice the number it received when the service began.

At the Florida Distance Learning Reference and Referral Center (RRC), librarians have begun experimenting with real-time online library instruction using a chat room as a virtual classroom. Rachel Viggiano and Meredith Ault describe their experiences and share tips and strategies for making online teaching and learning sessions successful. The software used by the RRC, ConferenceRoom Professional Edition by WebMaster, allows RRC staff to create new channels or "chat rooms" and to move users from one room to another, a feature that has proven helpful for managing large classes online. Other successful strategies involve the use of prewritten scripts and additional staff as classroom "helpers."

Diane Nester Kresh describes a different sort of experiment in taking reference into cyberspace, the Collaborative Digital Reference Service (CDRS) launched by the Library of Congress. Looking at public demand for both physical libraries and online reference, she concludes that librarians have strengths to bring to the online environment that will give us an edge over Web search engines. Collaborative reference offers a way to take advantage of individual librarians' subject expertise and the power of local library collections while providing the 24-7, one-stop-shopping convenience of the Web. The CDRS offers a viable model for how librarians and libraries can survive economically and reinvent themselves to meet their customers' increasing expectations for instantaneous delivery of information.

Developing policies and procedures, deciding who does what, and creating an efficient workflow are perhaps the most difficult parts of getting any new virtual reference service off the ground. A useful tool would be a model of virtual reference that librarians could use to help develop new services as well as critically examine current services to determine how they could be made more efficient and successful. Michael McClennan and Patricia Memmott of the Internet Public Library give us such a model in their article titled, "Roles in Digital Reference." The roles they define and describe are illustrated with case studies of the Internet Public Library's Ask a Question Service, the Saskatchewan Libraries' Ask Us! online reference service, and the Virtual Reference Desk Network sponsored by the United States Department of Education.

With all of the advantages of taking reference online, there remain plenty of problems with the technology currently available for doing so. Generally developed for e-commerce applications, the software lacks many functions that would help make online reference work effective. Steve Coffman, in his article "We'll Take It from Here," presents a wish list of developments we'd like to see in virtual reference software. Improved co-browsing and collaboration is on the list, as is Voice over Internet Protocol (VoIP) as a way to overcome the limitations of chat as a medium for conducting reference transactions. Steve suggests ways in which virtual reference technology could improve the efficacy of collaborative reference and describes a vision in which reference librarians create their own evolving online reference resources using the

Karen Ciccone (karen_ciccone@ncsu.edu) is Head of the Natural Resources Library at the North Carolina State University Libraries, Raleigh.

technology's ability to capture the work we do each time we answer a reference question.

The world of virtual reference is changing rapidly. New technologies will continue to arise that can be creatively adapted to our unchanging goal of providing patrons the information they want, regardless of location or format and in the most convenient way possible. It will be interesting to look back upon this time in five years (or even one or two) and see which solutions proved most promising and which were abandoned. If the articles in this issue are any indication, it will be an exciting period of continuing transformation. I look forward, with the rest of you, to helping create what happens next.

Virtual Reference at North Carolina State: The First One Hundred Days

Joshua Boyer

North Carolina State University (NCSU) Libraries launched an online chat reference service in January using Library Systems and Services LLC's (LSSI) Virtual Reference Desk. Traffic has been modest but significant (four chat sessions per day). Staff have responded to the service with interest and excitement as well as confusion and doubts. Future directions for the service include improving librarians' abilities to work in this new medium and extending the hours of the service. The author concludes by arguing that libraries must strive to create Web environments in which answers to the most frequently asked questions are easy for patrons to find without having to contact the reference desk.

You're an old pro at chat reference if you've been in business for a day. At least that's how it feels amid the mad scramble of academic libraries following the trail blazed by pioneers like Temple University libraries and the Lippincott Library at the University of Pennsylvania. NCSU Libraries launched its live, online reference service using Library Systems and Services LLC's (LSSI) Virtual Reference Desk on January 8, 2001. The most frequently asked question so far is from other librarians wanting to know how it's going. This article is an attempt to answer that question, as well as explain why we're on this path at all and where we think we're headed. Insights from colleagues as to what it's like to do reference in this new way will be included. In conclusion, it will be argued that as well as making reference help available during more hours and by more means than ever before, academic librarians should strive to make our online environments transparent and seamless enough that patrons can figure out how to start their research and find answers to basic questions on their own.

At the NCSU Libraries, we became interested in offering online, real-time reference for many reasons. We have moved aggressively to get as many indexes, journals, and books as possible online. To use our collections effectively, patrons must go online. If we push patrons onto the Web, it only makes sense for reference librarians to follow them there. NCSU also has an increasing number of distance learning students (roughly twelve hundred), some of whom will never visit the library buildings. For them, "the library's Web site *is* the library," to borrow a phrase from Julie Linden.[1] We are committed to providing for distance learners ". . . library services and resources equivalent to those provided for students and faculty in traditional campus settings," as ACRL's *Guidelines for Distance Learning Library Services* state.[2] In addition, chat offers a way to work around the inconvenience of patrons with one phone line having to get offline to ask the question they had about an online resource (Cindy Levine, humanities reference librarian at NCSU, offers an interesting counterpoint to this rationale, noting that the increasing use of cell phones may make the one-phone-line scenario less common as time goes on). Finally, virtual reference is a good fit at NCSU, a large university (twenty-eight thousand students) with students, faculty, and staff on three discontinuous campuses in Raleigh and distance learning students all over the state, the country, and the globe. Not everyone can easily stroll from their dorm or office to one of the libraries. The university, proud of its engineering and scientific endeavors, has a history of embracing and experimenting with technology. The libraries have a culture that matches this focus and are always on the look out for technologies that can improve services.

At D. H. Hill Library, the main library, chat reference was first tried in January 2000, using an IRC chat server. To make a long story short, the service failed miserably. It was much too complicated for patrons to figure out how to meet a librarian in the chat room. Lesson learned: make the chat service easy to use. Patrons are confused enough (otherwise they wouldn't be asking questions) without confusing them with the technological means by which they are supposed to ask their questions.

After shopping around for a good product that would be easy for patrons to use—no downloads, no configuring, just fill out a form and click—we chose LSSI's Virtual Reference Desk (see figure 1). In addition to chat, the Virtual Reference Desk offers what LSSI calls co-browsing. If a patron asks a question that leads the librarian to look up books in the catalog, the librarian can send the catalog screen to the patron's browser (see figure 2). Each successive screen in the search is sent to the patron. In LSSI's lingo, the librarian is "escorting" the patron. This feature caught our attention. On the phone and while chatting, reference interviews can become downright silly as librarians describe pages and processes on the Web to patrons who can't see them. Co-browsing allows the librarian to follow an old maxim for good communication: show, don't tell. The maxim is especially apt in our case, given the visual nature of the Web. The software also allows librarians to send files of any type to the patron—Word documents, PDF files, whatever the librarian wants to send (see figure 3). At the end of each session, both the librarian and the patron receive transcripts complete with all the URLs visited. It was an easy sell.

Once the software was acquired, an even more important consideration was how to staff the service.[3] The

Joshua Boyer (josh_boyer@ncsu.edu) is Reference Librarian for Distance Learning at North Carolina State University Libraries, Raleigh.

Research and Information Services department at D. H. Hill Library had solved that problem back in 1999 when it created a separate reference desk called the Off-Site Services (OSS) desk. At the OSS desk, (a room close to the regular desk), the librarian on duty answers phone and e-mail questions. The new desk, open from 9 A.M. to 5 P.M. on weekdays, is staffed in one-hour shifts by a librarian. Each reference librarian has a mix of hours at the traditional reference desk and at the OSS desk. The new desk is an effort to give equivalent services to regular patrons at the traditional desk and to those *off-site* patrons in their offices or homes who call or e-mail. Moving the phone off the regular desk has allowed librarians to answer questions without having the phone patrons and regular patrons interrupt each other. Having all reference staff monitor and answer e-mail questions in shifts throughout the day has improved the turnaround time dramatically. A response to e-mail questions is promised within eight hours, although four hours is the average turnaround time. The Virtual Reference Desk is another means by which questions can be answered from off-site, so the job of answering chat questions falls to whichever librarian is on duty at the OSS desk.

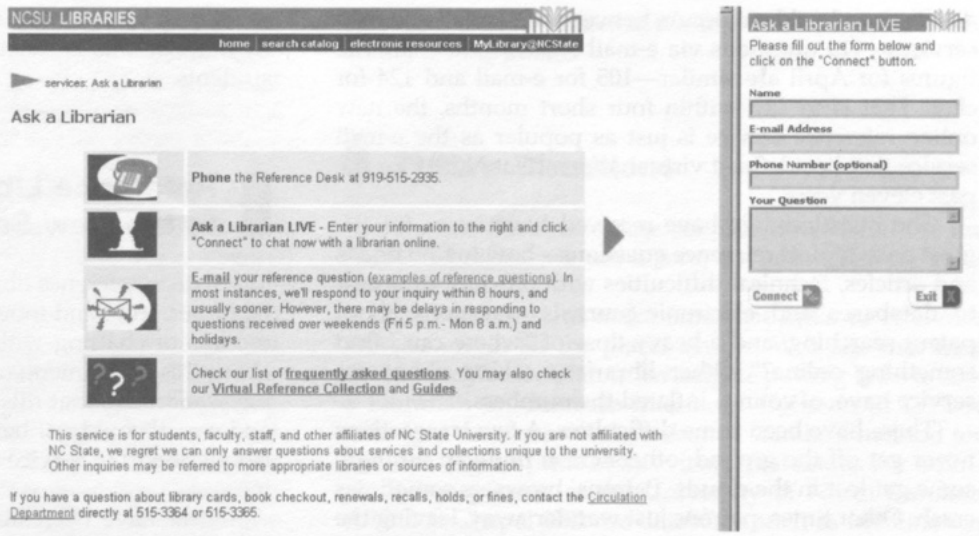

Figure 1. Patrons Fill Out a Form and Click "Connect." They Need No Software Except for a Browser.

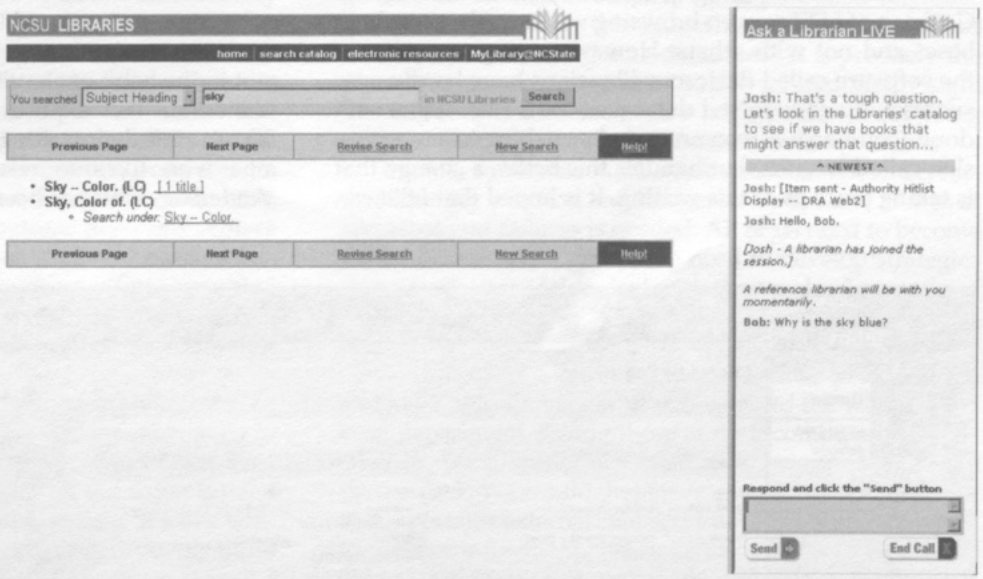

Figure 2. The Librarian Can Escort the Patron through a Catalog Search.

On January 8, a link was added to the NCSU Ask a Librarian Web page, and forty-one patrons showed up over the course of the first month. The librarians hoped the volume would be manageable as they got used to the software and this new method of communicating. February brought more inquiries—sixty-three. After the campus newspaper and several library publications publicized the service, we nearly doubled that number in March with 114. April held steady with 124.

A total of 342 questions over four months is a modest beginning, but a comparison to the volume of e-mail questions is revealing. During the same time span, January 8–April 30, the NCSU Ask a Librarian e-mail service has received 469 questions, 140 percent more than the chat service. But a closer look at those numbers reveals that the difference lies entirely in January and February, when the chat service was new and unpublicized. Starting in March,

a statistical dead heat occurs between the e-mail and chat services—119 questions via e-mail and 114 via chat. The figures for April are similar—105 for e-mail and 124 for chat. That is to say, within four short months, the new online reference service is just as popular as the e-mail service that has defined virtual reference at NCSU for the past eleven years.

The questions we have received have been, for the most part, typical reference questions—how to find books and articles, technical difficulties with off-campus access to databases and electronic journals, questions about patent searching, and a heavy dose of "where can I find something online?" Other librarians asking about the service have, of course, inflated the numbers.

There have been some difficulties. A few transactions never get off the ground; others crash midway through; some get lost in the clouds. Patrons' browsers sometimes crash. Other times, patrons just wander away, leaving the librarians chatting with themselves. The anonymity of online communication leads to odd behaviors not usually seen at the reference desk or heard on the phone.

As for the software itself, our primary concern has been with co-browsing proprietary databases. Steve Coffman of LSSI says co-browsing works with some databases and not with others. However, using a version of the software called Basic, our librarians have hardly ever successfully co-browsed databases. As a rule, it just isn't done. Coffman has recommended switching to a new version called Interact that handles this better, a change that is taking place as of this writing. It is hoped that LSSI can work with vendors to make co-browsing databases a reality because this is exactly what we would like to show students.

Reference Librarians' Reactions to the New Service

The sixteen reference librarians at D. H. Hill Library have had interesting and thoughtful reactions to their first few months of chatting with patrons. Some are enthusiastic about this experiment; others are more hesitant, wondering what niche chat fills that the traditional desk, phone, and e-mail could not better accommodate. So far, no one has derided the service as an experiment not worth trying.

There have been many encouraging chat conversations during which patrons have been impressed by the service. Eric Anderson, a library assistant, described showing Web pages to a patron and said, "The user really perks up when they can see what you're doing."

Chat, however, is a way of communicating that will take some getting used to. Most reference librarians at D. H. Hill Library, unlike many of the undergraduates, were not in the habit of chatting before the service started. It is a medium that requires some adjustment for those who like to craft their writing slowly and carefully. "I'm someone who likes to re-write what I've written," said Anderson, who has been doing e-mail reference at D. H. Hill Library since 1990. "I'm a perfectionist. It's a strange medium to work in for someone like me."

Rapid-fire conversations without nonverbal cues have interesting implications. "I've always known the importance of body language and all [that] we do at the desk to make people comfortable," said Mary Ellen Spencer, public documents coordinator. "I'm more aware of it now that we do chat because the absence of them is so striking." The lack of nonverbal cues can make chat difficult. For instance, the fourth person in line at a regular reference desk can see why they will have to wait, but the third patron in a chat queue won't know why they

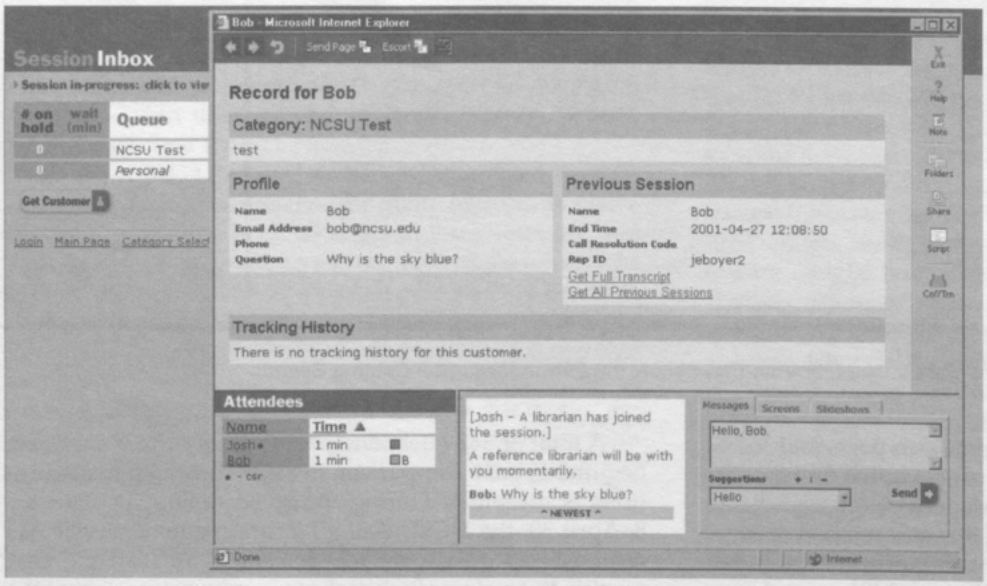

Figure 3. Librarian's View of the Virtual Reference Desk

waited so long and may show much less patience. But Spencer also pointed out a positive side to not seeing or hearing parons. "I don't get to see if the person is dressed well or how old they are. It makes us patron-blind in a way. It has made me more aware of how I react to those things at the desk."

Cindy Levine, humanities reference librarian, finds chat a strange way to communicate. "I feel like if I could talk to the person on the phone or if I had time to formulate an answer it would be better," she said. "I either want more immediacy or more time to think, and chat is caught right in the middle." Later, trying to explain why the overlapping back and forth of chat leaves something to be desired, Levine asked, "Have you ever played ping pong under a strobe light? It seems like it should work, that there's enough information there, and you should be able to hit the ball." But, as she recalled from this interesting childhood experiment, it doesn't work. "You realize how dependent your brain is on all the intermediary cues."

Despite its synchronicity, chat can be a painfully slow way to communicate, requiring patience on both ends of the conversation. Steve Coffman of LSSI is honest about the limitations of the medium. ". . . chat is a rudimentary and cumbersome way to convey *anything*, much less the complex content of many reference interactions."[4] Coffman is betting on the future of Voice over Internet Protocol (VoIP). This technology would allow us to hold on to the good aspects of virtual reference—its real-time nature, the ability to show remote patrons processes on the Web, and its location online, where an increasing amount of our collections and patrons are—and replace the clumsy chat mechanism when voice communication technologies become standard on the average computer. After all, we already know that the most effective use of the Virtual Reference Desk is to co-browse with patrons while talking to them on the phone.

The new service has created a new dynamic at the OSS desk. There are now two live, synchronous media to attend—phone and chat. Eric Anderson once tried to handle three chats and a phone call all at the same time, a level of juggling that worries Cindy Levine. "It's like talking on a cell phone and driving a car. I know people think they can do it, but statistically, they don't drive as well." Levine's biggest fear is that librarians may answer questions less accurately in order to give quick answers.

Spencer sees multitasking and accuracy as training issues. "At the desk we have strategies for dealing with overload. There are things you can do. What we haven't done successfully yet is develop those for [the OSS desk]. We need to give people strategies so that they don't feel like 'All this is happening to me, and I'm all alone.'"

Many of the reference librarians at D. H. Hill Library think that the success of the chat service depends on their ability to exploit the Virtual Reference Desk's co-browsing feature to show patrons research strategies. As Spencer put it, "We have to use it as more than just a substitute for the phone."

Future Directions

So now we have an online service. What next? At the NCSU Libraries, we see a long list of interesting challenges ahead.

First, we need to make sure that links to reference services are in all the places on our Web site that they should be. We also plan to investigate putting links to Ask a Librarian on database interfaces. Coffman of LSSI is talking to database vendors about a standard method for libraries to get a piece of this virtual real estate. For example, when patrons at the University of North Carolina (UNC) at Chapel Hill use databases such as Medline via OVID, they are offered a link on the OVID main search page to the Ask A Librarian e-mail reference service at the university's Health Sciences Library. Kate McGraw, information services coordinator, estimates that about one-quarter of the health sciences library's e-mail reference questions come from this link. This makes sense—what confuses patrons more than databases? It is precisely the place that patrons most need to see a Need Help? sign. The UNC librarians also get the added value of receiving patrons' search strategies in addition to the questions.

In order to become more effective at chat reference, further training, practice, and time to share tips and stories of successes and failures is needed. All of us need to become better chatters. As a group, we need to develop strategies and a staffing model to deal with the overload scenario of three simultaneous chats and a phone ringing off the hook. For this, we are considering using AOL Instant Messenger as a means of calling out for help. The lone person at the OSS desk could send a quick message to the whole reference department, asking those at their computers in their cubicles to log on to the Virtual Reference Desk and pick up the slack. We would then have an internal chat network to support our external chat service. We need to remember to use our judgement and switch from chat to the phone when appropriate, just as we now understand that a question involving back-and-forth e-mails can be clarified over the phone. Just because a complex reference question arrives via chat does not mean it can be answered with three sentence fragments and two URLs. We also need to remember when we are on the phone spelling out URLs and describing online procedures that we can have patrons join us online so that we can show them what we are talking about via co-browsing. It's a matter of getting used to a new tool, integrating it with the familiar ones, and knowing which ones to use when.

We need to extend the hours of our service. The old "9 to 5" won't cut it. As the only academic library to staff a

reference desk twenty-four hours a day with professional reference librarians, it only makes sense to offer the chat service as many hours as possible. We can't help the thirty-year-old professional woman of distance education lore—she who works on two online courses after tucking in the kids—if we're only available during banker's hours. Extending the service into the busy evening hours is a logistical hurdle that will be addressed in the coming academic year.

The NCSU Libraries have a confidentiality policy that is applicable to all user records. This will assure patrons that—in accordance with North Carolina law and library ethics—that information is not shared with anyone outside the library. We plan to develop a procedure whereby we regularly download transcripts and data from the Virtual Reference Desk, retain aggregate statistics only, and have LSSI then purge our records. The confidentiality policy, to be linked off our Ask a Librarian Web page, will tell patrons that we take this issue seriously. Most patrons probably have never even thought about confidentiality at the library. It is hoped they will be pleasantly surprised to know that librarians care about their privacy as much as doctors and lawyers. Indeed, privacy gives libraries a rare chance to shine. The Virtual Reference Desk is the perfect example; LSSI has customized for libraries software that was developed for e-commerce sites. While dot-com Web sites have the ability to attract millions of enthusiatic users, we can only dream of having their investment capital, their marketing savvy, their designers and programmers. However, when it comes to ensuring personal privacy, corporations can't possibly compete with us. It's as simple as the distinction between cutomers and patrons. We won't be selling our patrons' personal information because selling is not what we do.

The NCSU Libraries plan to take advantage of LSSI's "meeting room" feature, which allows a librarian to chat and share materials online with multiple people. I plan to use meeting rooms as a way to teach bibliographic instruction classes to geographically dispersed distance learning students. (See Viggiano and Ault's article in this issue on the Florida Distance Learning Reference and Referral Center's experiences with using chat for instruction.)

For now, the NCSU Libraries' chat service is staffed only by reference librarians at the main library, D. H. Hill. NCSU has four other branch libraries that could also offer via chat their specialized expertise on veterinary medicine, textiles, design, and natural resources. Coordinating reference services between multiple departments and multiple libraries even within one university is a complicated task regardless of the medium, but LSSI's Web-based system lends itself well to such collaboration. We will also investigate the benefits of collaborating with other libraries in our local Triangle Research Libraries Network, which includes UNC, Duke, and North Carolina Central University, and perhaps even libraries around the world through the Library of Congress' Collaborative Digital Reference Service project. (See Diane Nester Kresh's article in this issue.)

A Challenge for All of Us

Most importantly, the NCSU Libraries and other academic libraries need to improve their Web sites, catalogs, online services, and tools. Now that service is available to help patrons at any hour and via every medium that is practical in this day and age, there is a need to work on the reasons why patrons have to ask certain questions in the first place. This is not to suggest that the day has arrived when reference librarians can be replaced with AskJeeves. However, library Web sites should be able to answer the most frequently asked questions better than most do today. Reference librarians can only answer questions from the kind of people who ask reference questions. Some patrons will never come to the desk, call, e-mail, or chat with the reference staff. They will simply walk away without answers. Even for those patrons who are comfortable asking librarians for help, their time should not be wasted by making them contact us for answers that the Web site could provide in context. Reference librarians will always receive plenty of difficult questions that require their knowledge to answer no matter how brilliant the Web design, but surely better homepages can help answer the most common questions that are heard every day at the desk.

At the top of Vanderbilt University's main library Web site is a drop-down menu that answers these questions: "How do I . . . Find a book? Find articles? Get a book? Get articles? Renew a book? Recall a book? Get from Annex? Get help? What else?" (figure 4.) Think about your own library's homepage. How many of Vanderbilt's questions does it answer easily? Which questions does your Web site not answer at all? A good academic library Web site should answer all these questions in a way that an intelligent, patient freshman with little library experience can understand. Notice that Vanderbilt's questions do not use the words catalog, database, index, interlibrary loan, circulation, or reference. Someone in Nashville was thinking like a patron.

Many library homepages, NCSU's included, can be thought of as lists of ingredients with no recipes. Here's a catalog, some databases, e-journals, and ILL forms—now go do your research. Having praised Vanderbilt, now let me use their elegant list of questions to criticize their recipe-like answers. For example, "How do I get a book?" takes you to a page that tells you how to use the catalog, call numbers, WorldCat, and interlibrary loan to get books. What if instead of creating separate documents to explain our services, the services explained themselves?

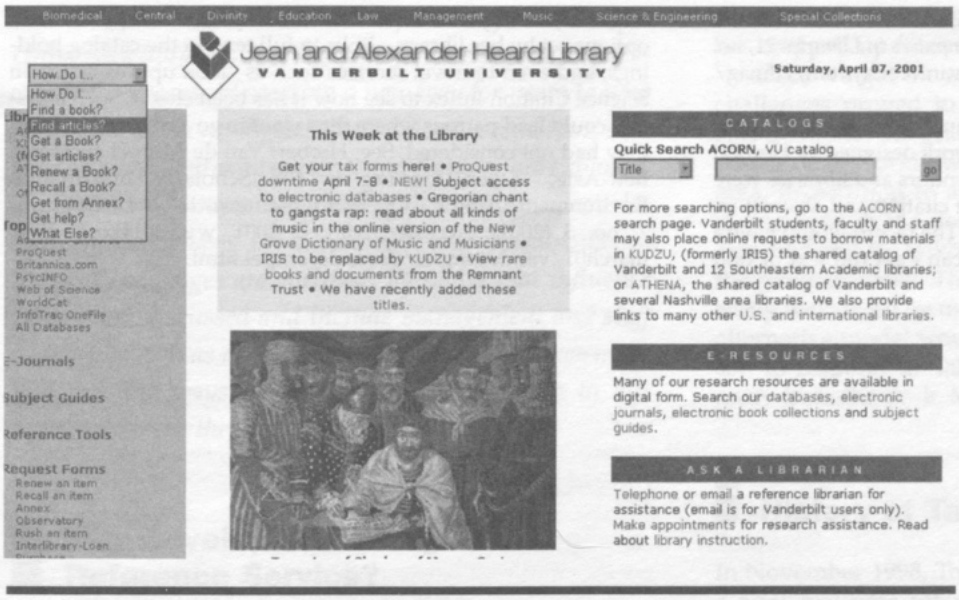

Figure 4. A "How Do I" List Answers Frequently Asked Questions

"How do I get a book?" could take you straight to a catalog that explained what it contained and did not contain, routed you to indexes if in fact you were looking for articles, and automatically suggested interlibrary loan if your search for a book came up empty? "How do I find articles?" could lead to an online wizard that asked you a series of questions and led you to appropriate indexes that could be extensively integrated with the library's catalog and electronic journals. In this way, the databases themselves could lead patrons back to your catalog to learn whether or not your library contained print copies of or provided online access to a particular journal.[5] In this weird cooking adventure, the ingredients themselves suggest how they can be used and combined.

Library tutorials can be useful, especially if they explain complex processes or concepts independent of particular systems. FAQs and knowledge bases have their place. But too often they just make up for the fact that libraries and vendors design tools that can be used only by those who already know how to use them. Amazon.com staffers don't sit around creating tutorials on how to find books in their catalog; their catalog explains itself. Before dismissing Amazon's catalog as simple in comparison to library catalogs and databases, recall that Amazon lists books they own and store in many different warehouses (not to mention music and other wares), lists books they don't own, estimates how long it will take to get any book, and when a search fails, provides links to used book stores, auctions, and a service that will keep looking for the book and inform you when it is found. All that, and you don't need to learn any jargon or go through a minute of training.

Librarians need to fight against technical solutions that are too complicated for most patrons to understand. When your number-one reference question is about your proxy server, get a better proxy server. NCSU Libraries recently switched to EZproxy, a product that does not require patrons to configure their browsers. This should simplify our services greatly and, in most cases, eliminate patrons' need to ask questions about the proxy server. They don't even need to know it exists. We should resist as much as possible vendor products that require patrons to download or configure software or remember yet another password.

Continuing to make our Web services more clear to patrons will not be easy. It will take hard work on our Web pages, catalogs, and internal systems. It will also require cooperating with and putting pressure on vendors and publishers to make their interfaces sensible and their data interoperable with our catalogs.

Of course there will always be patrons who will need to talk to us no matter how well our Web site answers their questions. Reference librarians will continue to help these patrons, indeed, treasure them. But everyone else—the vast majority—should be given a chance to figure out the basics of the library and its services without having to pause and contact the reference desk. This will remain true no matter what Star Trek-like holographic communications systems future librarians will use at the reference desk.

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2. Association of College and Research Libraries, *ACRL Guidelines for Distance Learning Library Services,* fall 2000, Philosophy. Accessed May 2, 2001, www.ala.org/acrl/guides/distlrng.html.

3. Actually, we have no software. The Virtual Reference Desk is Web software running on Egain's servers. Egain is the company that makes the software; LSSI has customized it for libraries. Some parts of the software are created by another company, Hipbone.

4. Steve Coffman, "Distance Education and Virtual Reference: Where Are We Headed?" *Computers in Libraries* 21, no. 4 (2001). Accessed May 2, 2001, www.infotoday.com/cilmag/apr01/coffman.htm.

5. One way in which databases and catalogs can be integrated is through the OpenURL framework designed by Herbert Van de Sompel and his colleagues. If vendors and libraries were to use OpenURL, a patron could find a citation and abstract in, for example, the Compendex database. The record would have a link that said something like, "Where can I get full text or find this in my library?" The link would then present the patron with options set by her library—links to full text, to the catalog holdings, and even to novel services such as "look up this article in Science Citation Index to see how it has been cited." Such a system could lead patrons where they want to go and even to places they had not considered. See: Herbert Van de Sompel and Oren Beit-Arie, "Open Linking in the Scholarly Information Environment Using the OpenURL Framework," *D-Lib Magazine* 7, no. 3 (2001). Accessed May 2, 2001, www.dlib.org/dlib/march01/vandesompel/03vandesompel.html.

Going Where the Users Are: Live Digital Reference

Sam Stormont

This paper describes the development of the Temple University libraries' live digital reference service and discusses the process of creating a new way for users to pose questions. Staffing, digital transactions, promotion, systems support, software options, and funding are explored. The creation of customized software in-house is considered with emphasis on advantages and disadvantages. Staffing challenges are outlined. Variables that influence success are discussed and include management and staff support as well as a recognition that to prosper, we must find creative ways to provide reference service to our users, wherever they are.

Why Develop a Live Digital Reference Service?

Before proceeding further, a definition should be given for what is meant by live digital reference. The goal of the Temple University libraries' live digital reference service is to allow patrons to submit reference questions using a computer and receive immediate responses. This service provides a response within seconds, as contrasted with e-mail reference, which can take hours or even days.

Users have had remote access to resources in the form of our online catalog for over a decade, and more recently with the advent of the Web, to online databases as well. The next step was to provide them with remote access to services in the form of real live reference librarians answering their questions in real time. This need for online services has been created by the dramatic increase in the number of students accessing our databases and other resources from home. Our students are quite comfortable with the Web; it's been integrated into their daily lives. And with the rise of the Web have come chat programs. Many teenagers frequently use AOL's Instant Messenger. Temple students are used to using chat programs and seem at ease with them. The students are also increasingly logging on from home and the Temple libraries are actively seeking ways to support these remote users and various university distance education programs.

Our executive leadership has been very supportive and was instrumental in creating a climate that allowed the development of the live reference service. The University Librarian encouraged exploration of new service approaches and clearly signaled her support for efforts to innovate. It was important for librarians to get the message that it was not just okay for them to experiment, but they were actually expected to do so. And further, that some things will be successful and others won't. Either way, valuable lessons will be learned. Continued support has made it possible to weather skepticism that has cropped up from time to time.

Once we got the service up and running, the greatest challenges proved to be issues related to staffing. Our current model integrates live online reference into the reference desk workflow. Everything is done from the desk area. In addition to answering in-person and telephone inquiries from the desk, as they always have, librarians also respond to TalkNow questions from a computer at the reference desk. This additional "access point" is generally welcomed by users, but adds stress for the staff. An alternative model would involve assigning a specific person to respond to TalkNow questions at some location away from the desk. More about this later.

History of TalkBack and TalkNow

In November 1998, Temple University libraries launched a new real-time reference service called TalkBack as a pilot project. This service allowed library users to connect directly with staff at the Paley Library reference desk through a link on the libraries' Web site. The user typed a question into a Web-based form that included name, e-mail address, and comment fields, and then clicked on a "submit" button to transmit the question to the library. A librarian received the question and typed in a response. The exchange was similar to a chat program interaction.

We received positive feedback about TalkBack, and students began using the service without publicity or promotion. We simply put up some links on the library Web pages, crossed our fingers, and waited to see if anyone responded. The lack of publicity allowed the reference staff time to get used to TalkBack. Articles were published in the library newsletter and the computer services newsletter, but it remained otherwise low-key.

As the pilot project progressed, we identified some shortcomings and set out to find ways to overcome those drawbacks and improve the service. We researched existing software by reviewing academic and trade journals, monitoring newsgroups and electronic discussion lists, and consulting librarians and faculty. No existing software package met all our criteria. Our eventual solution was a collaboration with two students in Temple's Computer and Information Sciences (CIS) department who developed a prototype based on our specifications.

Sam Stormont (stormont@temple.edu) is a Digital Reference Services Coordinator and Communications Subject Specialist at Temple University Libraries, Philadelphia.

In the course of casting about for a solution, a professor in Temple's CIS department was consulted who had provided guidance and advice to us during the development of TalkBack. Two students in the professor's interface design course needed a project and were interested in our idea. After meeting with the students and explaining what was needed, they set to work. We provided feedback over the next several weeks as work progressed. Work started at the end of March and by the beginning of May we had a prototype. We used the summer and fall of 1999 for testing and launched Temple TalkNow on December 20, 1999. Since the TalkNow software was written as a student project and the author released it under a General Public License (GPL), there was no dollar cost to the libraries. The GPL was developed as a mechanism to make software more widely and easily available.

> "The GNU General Public License is intended to guarantee your freedom to share and change free software-to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. . . . When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things." (Free Software Foundation 2000)

In the spring of 2000, we created the Interactive Reference Project Web site (www.library.temple.edu/ref/interactref.html), which provided some history of the development of the project. The TalkNow code was made available for anyone to download from this site. The original hope was that people would download the code, enhance it, then put the enhanced version back up for others to use and enhance, in a continuing cycle. Several libraries did download the software and at least one used it briefly in an experimental project.

How TalkNow Works

Temple TalkNow uses the Linux operating system (a version of Unix) and a scripting language called PHP. PHP is a server-side, cross-platform HTML-embedded scripting language that allows Web developers to write dynamically generated pages quickly. Here's how a transaction works:

1. The librarian comes to the desk and logs onto TalkNow. She's ready to receive questions at the workstation.
2. A user clicks on the TalkNow link, and is connected to the dedicated TalkNow server.
3. The TalkNow screen appears, telling the user that a librarian is logged on and explains that the user can type in his question.
4. When the user is ready, he submits the question by clicking the "send" button and the question appears on both his monitor and the librarian's monitor.
5. The ensuing conversation proceeds like a standard chat dialogue.

Providing Live Digital Reference Service to Extended Campus Users

At Temple University, several major issues have crystallized since we began offering real-time reference in November, 1998. They include staffing, promotion of service, technical support, service effectiveness, and the nature of digital interaction.

Digital Interaction

As we proceeded with our chat service, we discovered that as we anticipated, interacting online with a user is quite different from face-to-face and phone transactions, requiring additional skills and a specialized approach. For one thing, you have to be a fairly fast typist. You can't worry too much about typos as long as the meaning is clear. Chat requires a more telegraphic style. Short and to-the-point sentences are to be preferred over wordier responses. The time required to construct more elaborate sentences can leave the person on the other end wondering if you're still there. Text-based messages can be a frustrating way to communicate. Staff have commented "if only I could speak to him," meaning that it would be easier and faster to convey the information by telling rather than typing. This uncertainty about what's happening on the other end has caused some of our users to discontinue the conversation. For some of our librarians, the concern that the user might get tired of waiting and log off added a lot of anxiety and created a negative aura about the whole service. We use pre-formatted messages for frequently used responses, such as: "I'll be with you in moment," "This may take a few minutes," or "Thank you." These speed things up and also provide time to find information while letting the person know you're working on his question. The scripted messages have proved very helpful.

Staffing

One of the greatest challenges of real-time reference is staffing. Virtual reference is at least as labor intensive as traditional reference, perhaps more so. Our experience at

Temple has led us to the view that it is preferable to provide chat reference at a location that is separate from the desk used for in-person reference.

For the last two years, we have been offering all services—in-person, phone, and real-time chat—from the same desk. What this means is that we simply added chat to the existing traditional services we've always provided at the desk. This arrangement is fine if the desk isn't busy. However, we have discovered that it's extremely difficult to split your attention between someone online and someone in front of you. It is possible to juggle in-person and online, but one person has to wait.

As a practical matter, handling an online transaction isn't really much different than a phone call. In either case you must make a choice about who gets your attention. Two separate locations means fewer distractions and better service. We had initially considered moving the TalkNow service away from the reference desk, but decided against it, since this would require assigning a librarian to that location, and we felt our staffing levels couldn't support the additional location.

With experience and upon further consideration, however, we have moved closer to the view that two distinct locations are indeed desirable and it makes sense to shift more of our resources into services that support extended campus users. Statistics show that many libraries are experiencing a decline in face-to-face transactions (www.arl.org/stats/arlstat/1999t1.html, accessed Feb. 6, 2001). While there's some debate about the magnitude of this decline (Janes 2000), there seems to be a consensus emerging that fewer people are coming to the desk in person (Mayfield 2000).

At Temple we are currently experimenting with a model which allows librarians to handle chat, phone, and e-mail reference from their offices. The idea is to focus on in-library users from one location and extended campus users at the other location (the librarian's office). It's possible to log on to TalkNow from any computer connected to the Internet and the reference phone calls can be forwarded to a librarian's office. This pilot is being conducted on a very small scale at our main library (two librarians doing it a few hours a week), but it will give us a glimpse of what's feasible and help us work out the technical logistics. Some staff vacancies exist, which prevents us from expanding this test. When we are fully staffed, we will be able to get a better sense of the viability of this approach.

What we've discovered at Temple is that trying to do live reference from the desk means that users encounter "busy" signals (i.e., have to wait) too often. As a result, we've decided it would be best to conduct real-time reference away from the desk.

Another major issue is the perennial problem of unpredictable patron demand. If the reference desk is not busy, it is not problematic to answer an online reference question. However, if there are walk-in or phone patrons, the librarian must juggle requests. One possible solution to managing the extra demands created by live digital reference is to distribute the responsibility for answering questions among staff at different locations. The unpredictability of demand within a defined time period is one of the most vexing challenges facing any reference department. For instance, any given hour during which two people staff the desk may include periods when one or both librarians are not actively engaged with a patron as well as moments when four people show up at the desk simultaneously.

TalkNow is currently being operated exclusively by staff at Paley, Temple's largest main campus library. There are also departmental libraries located in different buildings on the main campus as well as libraries on other campuses (Ambler, Tyler, and Harrisburg). A major advantage of TalkNow (which we have so far been unable to make use of due to staff vacancies) is that staff at multiple locations can be logged on simultaneously and available to take a real-time question. Having several people available increases the odds that at least one person won't be busy with an in-person or phone patron. Since staff at multiple locations would be monitoring TalkNow, whoever is available can pick up a call when it comes in. The overall question load is thus distributed more efficiently based on availability. This approach could allow more questions to be answered more effectively, using the existing staff.

This model also allows staff at different locations to participate in the project in a very concrete way and thus feel involved and a part of it. As mentioned above, we have experimented on a very limited basis with staff being "on call" in their offices to take TalkNow questions. In the spring of 2001, two librarians logged on to TalkNow from their office computers in Paley and also forwarded reference desk phone calls to their offices. This does accomplish the goal of eliminating distractions so the librarian can give full attention and concentration to the user. But this staffing model requires either more staff, more hours per staff member, or a reduction in the total number of people on the reference desk (i.e., going down to just one person on the desk more often).

A slightly different, but complementary aspect of the above approach for managing staff workload and containing costs is referrals. A question taken by someone at the main reference desk may be more appropriate for the engineering library and can be referred to the engineering desk. Several products, including 24-7 Reference (developed for the Metropolitan Cooperative Library System—for more information, see www.247ref.org), and LSSI's Virtual Reference Desk, both based on eGain software, allow for this sort of referral. We had a trial of this software, which has been customized for libraries, and it seems promising. This approach also makes the best use

of available staff and provides better service by routing the question to a specialist. The 24-7 Reference product also enables pushing Web pages and co-browsing as well as chat, and automatically sends a transcript of the entire session to both parties.

In addition to managing workload effectively, it's important to create an environment that provides positive reinforcement to the staff members who operate the service. Problems need to be dealt with as soon as they occur to avoid any buildup of frustration or misunderstanding and also to prevent bad habits from becoming established. You should give staff discretion to develop their own style and to use their own judgement in answering real-time reference questions. Encourage suggestions to improve the service. For those who are less than enthusiastic, try to find some aspect of the service that piques their interest. In our experience, one person was interested in Web page design and was able to improve the look of the live reference page. Other critics were the source of some of the most useful suggestions. They pointed out areas for improvement such as certain conditions that caused users to be dropped.

You should plan to phase in the service gradually to give staff a chance to get accustomed to the software and the new way of interacting with patrons. Allow staff to "own" part of the project. Make sure they feel invested and try to develop an atmosphere that helps everyone to feel involved in the service.

Promotion

Another major challenge is advertising your service. E-mail reference in academic institutions has consistently drawn only a small handful of users as compared with walk-in users. Live online reference at Temple University is following the same pattern of only a few questions a day, although we know that many people are searching and using our Web pages. Although we'd like to think our Web site is easy to navigate, it's unlikely that users are finding everything they need easily and quickly on the Web pages, and therefore do not need reference help. It is more likely that our e-mail and live reference service has not been sufficiently publicized. Temple's publicity efforts have included publishing articles in the library and computer services newsletters and the campus newspaper, promoting the service to supervisors of all the campus computer labs as well as all the staff in our main and branch libraries, and including multiple links to TalkNow on the libraries' Web pages.

There has been a significant increase in the number of questions handled, though it's difficult to say what may have caused the increase. During the first six weeks we offered the service, usage averaged twelve to fifteen questions per week. By this past spring, use had just about doubled, averaging twenty-five to thirty questions per week.

How can we make more people aware of our service? One idea we've considered is sponsoring a contest, with prizes like a Palm or even a laptop computer. It's also important that the link for live help be positioned prominently on the Web pages (preferably at the top level) and not buried several levels down. The link should appear on many different pages on the Web site. Joe Janes has commented that his ideal would be a button that followed him as he moved from page to page.

With the upcoming redesign of the Temple libraries homepage, the TalkNow link will be positioned more prominently (it is now on the homepage, but users must scroll down to see it). The link will also be included on additional pages throughout the library Web site to increase TalkNow's visibility. In addition, the library has initiated a partnership with the Online Learning Program (OLL) at Temple. Staff in Online Learning created a link to TalkNow on the OLL Web site and they mention the service in presentations to various university departments.

Advertising and marketing are traditionally weak areas in libraryland. Promotion and publicity duties need to be written into someone's job description and the job has to be structured so that the person has time to devote to these activities.

Technical Support

Technical support is a critical issue for live digital reference services. Not only initial, but also long-term support needs to be considered. The cost for support will vary depending on what model is used. By far the most common and practical solution for most libraries at this point is to purchase or subscribe to a commercial live reference product that is being updated and supported. While "grow your own" software developed in-house by students or university staff can sometimes work quite well (e.g., Gopher and Mosaic programs), it is often difficult to maintain over time. We found that once the student programmers had completed their project, they were willing to make a few minor modifications and clean up a couple of bugs, but after that, they wanted to move on to other projects. They had been forthright during development and implementation and made it clear that they did not intend to take on continuing responsibility. They delivered code that worked and met the agreed-upon specifications and rightly felt their obligation ended there. One significant error we made was not requiring complete written documentation as part of the original specifications. We've never had any documentation for the TalkNow software and therefore have had to use it in its original form. We also have a small systems staff, none of whom could code using PHP.

In the spirit of the open source software concept, we made our TalkNow source code freely available on our Web

site, and a number of libraries did express interest in trying to use it. But so far we haven't been able to make it easy and convenient enough for other libraries to try this route.

Software

Most of the live help software is available from Applications Service Providers (ASP). This is a popular model in which the software resides on the company's server rather than the library's server, thus reducing maintenance and support demands. All transactions are routed through the company server. Most live reference products use this approach, which shifts the costs from the hardware and library systems staff time to the licensing of the software product itself.

TalkBack, the first package we used at Temple, was a commercially available program but was no longer being updated, enhanced, or supported. We were able to use the existing program for a very modest cost (almost free), but we were on our own with regard to enhancements and technical support. Consequently, we used the program in its original state. TalkNow, our second-phase program that was created by librarians collaborating with students, was also free and we could customize the software to meet our specific needs. The significant drawback to this, of course, was that the student authors moved on to other projects and were not available to provide further enhancements or support.

As mentioned above, purchasing a commercially available package is the route taken by most institutions. This option offers many advantages. It means that support and upgrades will be available; it eliminates the time required to design and write software; and it means that it isn't necessary to assign someone (assuming someone with the necessary expertise is even available) the task of creating a software program. If the library uses an ASP, hardware and maintenance costs, as well as the time of library systems staff, will be saved (heads of systems departments often like this option, especially if they have small staffs). There are many very robust products now available (see the LiveRef(sm) list at: www.public.iastate.edu/~CYBERSTACKS/LiveRef.htm, accessed May 30, 2001).

Many live reference software solutions can at first seem relatively expensive, running into four or often even five figures. But when weighed against the cost of hiring additional staff or devoting the time of current staff to maintenance and support at the expense of other library projects, it can become cost effective.

Grant Support

Some libraries have funded live reference projects using grant support. One example is 24-7 Reference, a project of the Metropolitan Cooperative Library System (MCLS), supported by Federal LSTA funding and administered by the California State Library (www.247ref.org). MCLS is an association of thirty-one independent city and special district public libraries located in the greater Los Angeles area that have agreed to cooperate in providing library service to the residents of all participating jurisdictions.

Another effort is Ready for Reference, a pilot project also funded with LSTA monies. Through a cooperative partnership, eight academic library members of the Alliance Library System in Illinois are offering live, real-time, Web-based twenty-four-hour-per-day, seven-days-per-week reference support to their collective academic communities. Using LSSI's Virtual Reference Desk product, the participants share online reference duty during hours of normal library operation, and use LSSI's back-up reference service after hours and for back-up assistance.

Grants provide a way to secure outside funding, rather than trying to carve out additional funds from an already stretched existing budget.

Service Effectiveness

Temple's real-time reference service has received over two thousand questions to date and many favorable and constructive comments from users. The number of TalkNow questions has steadily increased and we now receive about twice the number we got when we started the service. A more in-depth analysis, using the archive of questions, will give us a better understanding of the effectiveness of the service. This brings up another point. We discovered a bug in the program that prevents downloading the transactions into files we could easily manipulate. The sessions are still being archived, but moving them has become tedious and time-consuming and some files were lost. A good example of why readily available technical support is essential.

We realized that we needed an evaluation mechanism to help gauge whether live reference was a useful service. We created a hyperlink on the TalkNow page that allowed students to submit comments, but no one used the comment form. This led us to conclude that a better approach would be for the librarian to proactively ask the user to rate his or her satisfaction level at the conclusion of a session. Most of our user evaluation information has come in the form of a student saying something like "this is a great service" as part of a thank you at the end of a chat.

Conclusions

When considering relative costs for providing services such as live digital reference, it is necessary to be aware of what not offering the service would cost. Library users

now expect services to be available on the Internet. Libraries must act decisively to provide the online help and services that patrons expect. There is evidence that people would prefer to use a librarian or library service if one is available, but even stronger evidence that what a majority of people actually use is search engines. We must expand our efforts to provide live reference services on the Web and make them known to our users. We must find creative ways to reach our patrons and make them aware of all the resources available to them that the search engines don't uncover.

Live digital reference services are in the early stages of development. The chat, collaborative, and Web contact center programs we have today represent the beginning of services that will evolve by leaps and bounds during the next few years. We need to continue to push the envelope and serve our users wherever they are.

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Online Library Instruction for Online Students

Rachel Viggiano
and Meredith Ault

As part of their efforts to provide library services to distance learners, the Florida Distance Learning Reference and Referral Center (RRC) librarians offer real-time online library instruction using a chat room as a virtual classroom. RRC librarians share their experiences with online instruction, pointing out some considerations that should be made when preparing an online library workshop, and some of the challenges that they have faced in their endeavor.

According to the ACRL *Guidelines for Distance Learning Library Services,* "The instilling of lifelong learning skills through information literacy instruction in academic libraries [. . .] is of equal necessity for the distance learning community as it is for those on the traditional campus."[1] If librarians are responsible for the information literacy training of distance learners, how will they reach this geographically diverse community? Students who take online classes sometimes live far from their school. They may do their research entirely online or they may rely on the resources available at libraries near their home. The librarians at the RRC provide reference and instruction to students enrolled in distance learning courses, and they face the challenge of providing bibliographic instruction to students who never meet in a physical classroom, students who may never step foot inside their library. In order to meet the instructional needs of students in online classes, this group of librarians recreates a traditional in-person research skills training session in a chat environment.

Introduction to the RRC

The RRC provides library and research support services to students enrolled in distance learning courses at seventy-three regionally accredited, Florida-based colleges and universities. The RRC is part of the Florida Distance Learning Library Initiative (DLLI). DLLI is a state-funded project created to support the research needs of distance learners throughout the state by providing reciprocal borrowing privileges, an interlibrary loan courier system, electronic databases, and reference and instruction assistance.

The RRC supports distance learning students and faculty at Florida's ten state universities, twenty-eight community colleges, and thirty-five independent academic institutions. Physically located in the Tampa Campus Library at the University of South Florida, the RRC is open seven days a week, five of those days until 1 A.M. Five professional librarians and three graduate assistants (from USF's School of Library and Information Science) staff the office. These librarians and graduate assistants work flexible hours, including nights and weekends, in order to meet the needs of Florida's distance learners.

RRC Services

The RRC provides a variety of services to both distance learning students and faculty. The services available to students include ready reference assistance and in-depth research advice, including assistance with selecting and searching various library and Web resources. The staff also provides basic technical help with accessing proprietary resources remotely, especially with patron authentication and the use of proxy servers. Another function of the RRC is to provide referrals to students' home or local libraries and the services that can help them conduct library research from a distance.

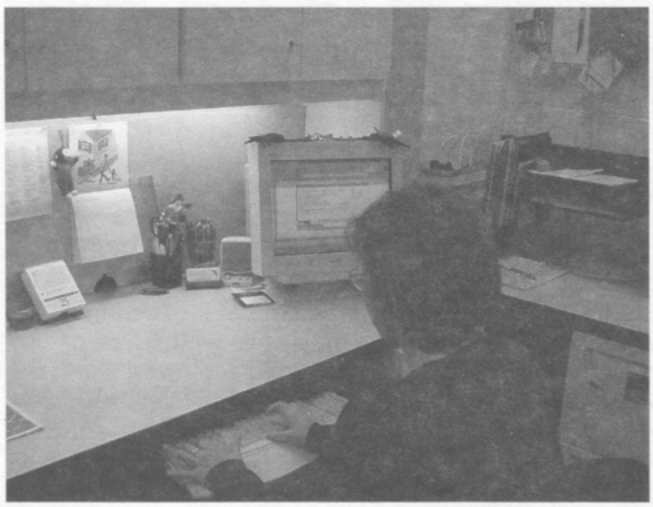
Distance learning faculty are eligible for all of the reference services offered to students, and they can also take advantage of some additional instructional services that benefit their students. These additional services include on-site, online, or broadcast library instruction sessions, course-specific Web pages that highlight appropriate research resources for their class, and brochures and print handouts describing the library services available to their students.

Use of Chat Software

The RRC provides most of its reference services virtually, with patrons contacting the center by toll-free phone, Web forms, and e-mail. The librarians at the RRC began investigating chat as another means of communicating with users, especially those who need immediate online assistance. In April 2000, the RRC started piloting a service called RR*Chat*, which provided real-time virtual reference assistance to its users.

The RRC investigated many of the chat software packages that were available in the winter of 1999. While examining the software available at that time, it was discovered that there were no chat programs designed specifically for use in a library setting. Most of the software

Rachel G. Viggiano (viggiano@lib.usf.edu) is Distance Learning Librarian at the Florida Distance Learning Reference and Referral Center in Tampa, Florida, and **Meredith Ault** (mault@utsystem.edu) is TeleCampus Librarian at the University of Texas TeleCampus System.



Carlene Jaworowski, a distance learning librarian at RRC, instructs online students in a virtual classroom.

available was either call-center oriented (like LivePerson) or made for very basic chat (like AOL Instant Messenger). The staff of the RRC looked at a variety of software packages including HumanClick, LivePerson, and WebLine. Some of the criteria used when comparing the software programs were: ease of use, features of the software, download requirements, number of simultaneous users, logging and customization capabilities, and price.

The RRC eventually chose ConferenceRoom Professional Edition chat software by WebMaster, Inc., (www.conferenceroom.com). At that time, WebMaster also sold a Personal Edition of the ConferenceRoom software that allowed the users to create new channels or "chat rooms." The Professional Edition allows only the chat operator (in this case the RRC staff) to create new channels. The Professional Edition was chosen over the Personal Edition in order to avoid the "bordello effect" that might occur if users were able to create their own rooms and carry on personal conversations that could be potentially off-topic.

Because the RRC serves such a diverse population of distance learners, the staff was very aware of possible technical constraints and felt it was important to select a chat program that was easy to use and did not require the user to download or install any software. RRC librarians felt that the ConferenceRoom interface was easy to use and fairly intuitive. The software allows multiple simultaneous users, which was also considered an important feature since the possibility of online "classroom instruction" existed. ConferenceRoom Professional Edition cost approximately $800, which was a one-time fee.

When RR*Chat* was launched as a pilot project in April of 2000, the service was made available Monday through Friday from 8 A.M. to 8 P.M. These hours of operation were chosen because during these times the office is staffed with more than one person. RRC librarians made the decision to not offer chat reference when only one person was on duty, fearing that phone, e-mail, Web form, and chat reference might be too much for one staff member to handle at one time. These original hours were found to be manageable for staff, so they were maintained after the pilot project was concluded, and are still in effect. The busiest time for the chat service so far has been in the evenings, particularly the 7 to 8 P.M. shift, and extended hours are being considered. It was decided that two staff members would be available in the chat room during RR*Chat* hours, whenever possible. This was done so that the RRC staff-to-patron ratio does not overwhelm the user, and also so there is always a staff member available, even if one is away from their desk or busy helping another patron.

Since the beginning of the RR*Chat* service, over 175 chat interactions have been logged. A number of visitors have been librarians from around the country logging on to see the software and experience a chat reference interaction. Many distance learners have also used the RR*Chat* service for its intended purpose, to interact in real-time with a reference librarian. It has been especially helpful for troubleshooting technical problems with students who only have one phone line and cannot be online and on the phone at the same time.

Using chat software for reference and instructional assistance has potential for a number of reasons. Many distance learners have experience using Internet technology, including chat, as a mode of communication, so they are already comfortable contacting a librarian this way. Chat reference can be a cost-free option for international students. The RRC's toll-free phone number works only within the continental United States, but students in other countries who have Internet access can reach a librarian online via RR*Chat*. The chat software also offers students with disabilities, particularly the hearing impaired, another option for communicating with the staff of the RRC.

Instruction Using Chat Software

RRC librarians have traditionally provided library instruction to distance learners either in-person at off-campus locations or via satellite for broadcast classes. Unfortunately, there had been no opportunities to conduct instruction sessions with online students because they rarely meet in-person. To reach this growing population of students, the RRC staff began to offer library instruction sessions in a virtual classroom.

The first instruction session the RRC conducted using chat software was in May of 2000 for an online education class from the University of West Florida. This online

workshop actually took place in the class courseware chat room because the students were already familiar with that technology and comfortable in their existing online environment. Since June of 2000, all online instruction sessions have taken place in RR*Chat*.

The RRC has conducted over fourteen chat instructions sessions for 130 distance learners from several of Florida's universities. The topics covered during these chat sessions have included: library services available to students; remote access issues, including proxy configuration; selection and searching of online catalogs and databases; and basic research techniques like developing effective search strategies.

Once the RRC's online research workshops were planned, through collaboration with faculty teaching online courses, they were publicized via class the class electronic discussion list (if available) and through the instructor. Advanced registration was requested of all participants, though no students were turned away for not registering.

Before each session, RRC librarians created new channels or "classrooms" in RR*Chat* to accommodate the expected students. Each classroom was staffed with at least two RRC librarians or graduate assistants. As students entered RR*Chat*, a helper (usually a graduate assistant) in the main chat room or "lobby" would move them into the classroom. With the ConferenceRoom software, staff can move users from room to room with a simple command. In this way, RRC staff controls the number of students in each classroom and creates additional channels as necessary.

Transcripts of the instruction sessions were recorded by connecting to RR*Chat* using the XiRCON IRC client, and these transcripts were then made available to the class for future reference. Usually the transcripts were manually e-mailed to all participating students and posted to the RRC Web page the day after the instruction took place. The transcript provides a written record of the discussion that can be read by students who missed the session or those who want to review what they learned. The Web transcripts are helpful because they include live Web links and search strategies that were covered in the session. The users can refer to the transcript when trying to replicate the research process on their own.

Considerations for Chat Instruction

There are many issues to consider when providing online instruction using chat software, regardless of which software is used and what type of instruction is being provided. These issues include registration, staffing, use of scripts, and technical problems.

If sufficient staff is available, the RRC makes every effort to schedule more than one instruction session for each class, including at least one night or weekend session. This helps accommodate students' busy and varying schedules. When an upcoming session is publicized, RRC librarians request that all participants register in advance to ensure adequate staffing. Registration directions ask each student to send an e-mail to the RRC stating their name, which session they'll attend, whether or not they have a valid student ID, and whether or not they have successfully set up proxy on their browser to access library databases. If the student does not have an ID or has not been able to access library databases, RRC staff can work with them before the instruction session to make sure they get these issues straightened out.

It has proven helpful for RRC librarians to e-mail the students who register in advance, providing basic information about the chat service such as basic commands and how to log on. Students are encouraged to stop by the chat room before the instruction session in order to become comfortable with the way the software looks and works.

Multiple chat rooms can be created to keep the class size manageable. It is wise to limit the number of users in one chat room; a small group atmosphere encourages more interaction among the students and makes the session easier for the facilitating librarian.

The staffing of the chat classroom is very important. RRC librarians staff the chat room much like they do when teaching a hands-on class in a computer lab. One librarian leads the discussion and keeps the lecture moving and at least one additional librarian answers off-topic questions and assists students who are having difficulties. Having extra staff available is important because some students are not familiar with the chat technology and may fall behind in the discussion, become frustrated, and quit the chat session prematurely.

A pre-written script can be a helpful tool for conducting online instruction sessions. The script helps keep the lecture on topic and it offers a quick and accurate alternative to typing in long paragraphs of text. Text from the script can be copied and pasted into the chat software as the session progresses. Questions will inevitably arise that might alter the direction of the session, but RRC librarians have found it helpful to have a pre-written script to provide a good foundation for the instruction.

Librarians attempting online instruction should be prepared for the unexpected technical problems that sometimes occur. These problems may include the server being down, software glitches, or technical problems on the student's end. A back-up plan is helpful so that problems can be handled with the least amount of confusion and disruption. The back-up plan can include additional staff available to assist students with technical problems, scripted instructions for dealing with certain issues, or possibly a "rain date" if the session has to be rescheduled.

Challenges of Chat Instruction

One of the possible limiting factors of using chat in an instructional setting is the robustness of the chat software itself. Although the ConferenceRoom software allows users to "push" URLs (all URLs are live links that open in another browser window), it does not include collaborative browsing capabilities. Collaborative browsing allows the instructor and the student to explore a Web site at the same time, displaying what the instructor is doing on the user's screen. The ability to collaboratively browse Web pages and databases would make the use of chat software for instructional sessions an even more powerful tool. In the case of RR*Chat*, the limitations of the software directly impact the instruction session.

Many students are very comfortable with the Internet and its associated technologies, but some are not. Occasionally it can be a challenge to provide library instruction via chat because some users must not only learn the library content of the session, they must also learn how to use the chat software. This can add a layer of complexity that is overwhelming for some students. For this reason, RRC librarians encourage all participants to try using the chat software before the scheduled instruction session, to gain a familiarity with the basic functions. RR*Chat* is very simple for users—they simply type their message in a text box and hit enter to send it. In order to participate in a chat workshop, this is basically all participants need to know.

Chat technology is not always the most effective way to reach large numbers of students at one time. If too many students are engaged in a chat session it can be chaotic and less effective. As a chat instruction session progresses, it is important to make sure all students are following along. When the librarian in charge asks whether or not everyone is caught up, it can waste precious time to wait for a large number of students to respond. RRC librarians have found that online workshops are most effective when there are fewer than ten students in each room. This inherent shortcoming of chat technology is minimized by offering multiple sessions of the same instructional program, which reduces the number of students in each session.

The RRC plans to continually improve and expand the RR*Chat* service and the instructional use of chat technology. Other chat and call-center software packages will be evaluated by RRC staff, and collaborative browsing may be incorporated into online bibliographic instruction in the future. As the Florida State University System investigates a cooperative electronic reference service, it may be feasible for the RRC to participate in consortial purchasing of more elaborate software.

Reference

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From Sshh to Search Engine: Reference.net on the Web

Diane Nester Kresh

The explosion of information and the popularity of the Internet and commercial search engines has required librarians to look afresh at their profession. With the overwhelming amount of information now available have come new demands and expectations. The need to bring information to the remote user has encouraged the creation of many innovative services linking new technology with traditional library services. How do librarians build on their age-old status as trusted advisors and create services that will both meet demand and revitalize the profession? How do we take the reference desk to cyberspace? The Collaborative Digital Reference Service (CDRS) launched by the Library of Congress and partner libraries is one such response. CDRS provides professional reference service to users anytime anywhere through an international digital network of libraries. This article explores how CDRS began and what lies ahead for this and other innovative e-reference services.

The world of the reference librarian is changing; electronic discussion lists are crammed with queries from librarians seeking advice on setting up 24-7 live reference and chat services, while job announcements search for "energetic," "dynamic," and "highly motivated individuals" to lead teams in implementing "innovative tools and services." Cybrarian versus librarian debates abound.

"Location, location, location" is not only the realtor's mantra as workshops and training classes instruct librarians in the art of providing distance reference to wherever the patron may be. At the 2001 Midwinter Meeting of the American Library Association, the virtual library was very much in evidence, featured in everything from a joint Library of Congress-OCLC symposium on the Virtual Reference Desk to several demonstrations of live chat software with which many libraries are experimenting. Throughout the meeting, the virtual library was demonstrated, evaluated, and ultimately validated as scores of librarians shared their personal experiences in evolving traditional services into the online environment without sacrificing quality or accuracy.

The challenges for librarians remain, however. Though more and more users are online, an increasing number of studies confirm that the Internet is complex and hard to use. The best search engines cover only a third of the Web; the rest is "invisible"—hidden in databases that cannot be penetrated by search engine spiders. Librarians are needed more than ever to sift, sort, select, and serve.

Just as the Internet is growing—more than 1 billion pages and counting—so too are libraries. According to *Bowker Annual 2000,* more than 806 million volumes are housed in academic libraries in the United States alone. Moreover, of these 806 million, 449 million are unique and only available in one particular library. These figures do not include nonprint format materials which are also increasing in number.

One salient difference between libraries and their online information service counterparts is that the numerous Web-based reference services search only the Internet, not the vast collections found in libraries nor the thousands of library online catalogs that describe and manage those collections. Libraries, with their diverse collections of artifactual knowledge, host inestimable opportunities for information mining. In addition, libraries are stocked with reference staff who have carved out areas of subject specialization built upon years of academic study and personal experience. Let's face it, there is no substitute for the daily practice of sitting at the reference desk and fielding questions that can come from anywhere.

Building on Strengths

Libraries are different from the Internet in a number of other ways. For example, librarians organize information using controlled vocabularies and other standards tools to make materials accessible. We evaluate materials carefully before selecting them and according to documented policy statements and guidelines. Our collections are unlimited in scope and include print, nonprint, and digital formats. Patrons can now conduct research and ask questions in person, in writing, by phone and fax, and online by e-mail. Video conferencing has been tested and there is a plethora of "live chat" programs to choose from. The hallmarks of libraries—structure and organization, in-depth subject expertise, community-vetted standards and best practices, and analog collections—enable us to bring order to the universe of unstructured and unverified information on the Internet. By so doing, librarians can bridge the gulf that exists between providers and users of information.

The CDRS, launched by the Library of Congress in the spring of 2000, provides professional reference service to

Diane Nester Kresh (dkre@loc.gov) is Director for Public Service Collections, Library of Congress, and Director of the Collaborative Digital Reference Service (CDRS).

researchers anytime anywhere, through an international, digital network of libraries and related institutions. With a growing membership of more than eighty libraries, CDRS enables libraries to help each other serve all of their users, no matter where the users are.

CDRS combines the power of local collections and staff strengths with the diversity and availability of libraries and librarians throughout the world, twenty-four hours a day, seven days a week. All reference, all the time; always a librarian available to provide answers to questions and connect patrons to the resources they need when they need it. The power of CDRS was made evident recently when a patron submitted a query to CDRS through his local public library and was helped by a language specialist at a university library who provided a transliteration of a Saudi place name—all within a matter of hours. The patron was thrilled to learn that through CDRS he had access to some of the world's premier libraries and collections.

How Does CDRS Work?

The Library of Congress began building CDRS in the spring of 2000. From the beginning, libraries of all types—special, academic, public, and national—joined the effort to help shape and define CDRS. The collaboration has been enormously beneficial on many levels as each library brings its special experience, knowledge of user behavior, and subject expertise to bear on the project.

CDRS includes two component parts: submission of questions and answers, and archiving of the answer for future use. The workflow looks like this: an end user requests information through a CDRS member institution. The member institution sends the query to the online Request Manager (RM) software for processing and assigning. The RM searches a database of CDRS member institution profiles looking for the member institution best suited to answer the question. Matches are made on the basis of such data elements as hours of service, subject strengths, scope of collections, and types of patrons served. The "match making" happens in milliseconds. Once a match has been made, the query is sent to that institution for answering. After the query has been answered, it is routed back to the original CDRS requesting library via the RM (see figure 1).

The library profile is the core of the routing and assignment activity, and each institution can "code" itself as broadly or as narrowly as it chooses. Library profiles contain basic information about the library, including hours of service, collection strengths, staff strengths, education levels served, languages covered, geographic location of users served, whether there are special services provided and what they are—as many as twenty-eight data fields. This information is captured in a table where it is used by the online RM to sort, assign, and track incoming questions and to deliver answers to the end user that are edited and stored in a separately searchable knowledge base of information. The knowledge base, to be populated with the diverse and authentic information provided by CDRS librarians, will ultimately serve as a front end to CDRS, designed to "catch" and answer incoming questions if there is a ready match. If there is no match on the knowledge base, the question will be routed through the RM and assigned to a member library. The profile tool is flexible enough to allow for regular updating to reflect staffing changes or special circumstances that would affect the automatic routing by the RM. For example, if the astronomy specialist is on sabbatical for

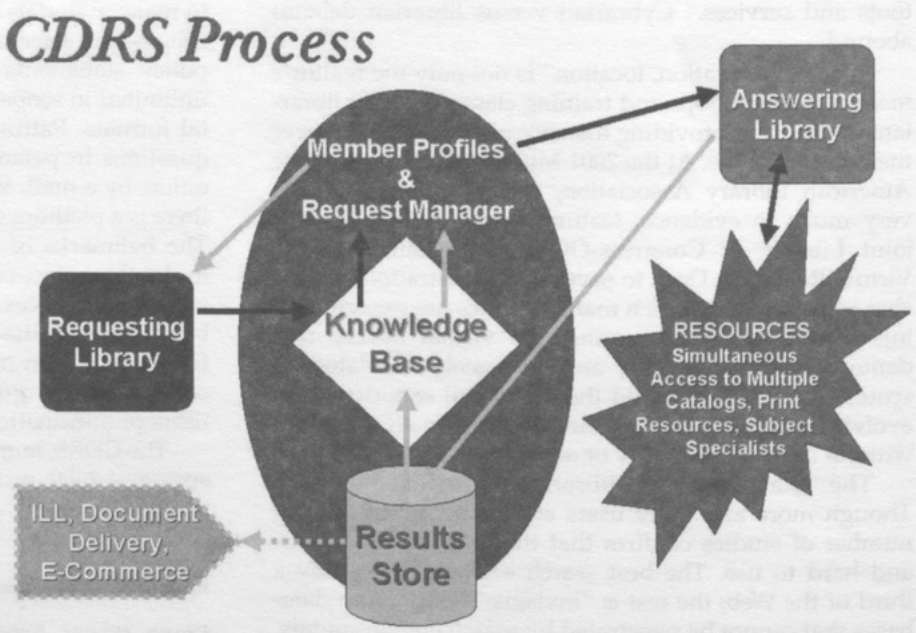

Figure 1. CDRS Process Workflow

several months and no back-up is available, the library might choose to remove that subject strength from its profile until the staff member returns.

"Watson, Come Here."

Sixteen libraries began the journey to build CDRS. From the beginning, we defined the business rules and concept of operation by which CDRS would be created and implemented. For example, we agreed that: CDRS is a membership model; CDRS builds its infrastructure once and shares that "cost" among its members so all can afford to use the service; CDRS is open and members need only Internet access, a browser, and e-mail to use it; Quality is number one and policies, certification, and Service Level Agreements (SLAs) are enforced to ensure that the brand lives up to the market's expectations; the technology platform is built to serve the membership as a whole; and finally, CDRS is an international service that does not provide preferences to certain jurisdictions or members.

The implementation process began by initiating a series of pilot tests of the technical solutions. Pilot One had two principal goals: to test the effectiveness of the library profiles and to test a Web form for submitting questions. Results indicated that more standardization of the data elements was needed—for example, agreement on use of a standardized tool such as a truncated version of the Library of Congress Classification schedule to describe a library's subject strengths. All of the libraries contributed edited sample questions and answers, which were sent through the system according to a scripted schedule.

In Pilot Two, we added more institutions worldwide, increased the number of questions asked of the system, revised the profile database, and began to experiment with software packages to serve as the RM. On the administrative end of the project, we began to develop a variety of SLAs, to identify staff training needs, and to identify the roles of a CDRS volunteer advisory board. The first "live" question was posed on June 29. This reference inquiry—regarding ancient Byzantine cuisine—was sent by EARL Ask-A-Librarian, a participating public library consortium in the UK. The request, received by the CDRS server at the Library of Congress in Washington, was matched based on subject matter, depth of detail, and time of day, and routed to the Santa Monica Public Library at 10:40 A.M. Several hours later, a list of five books was on its way to London. So the "test" worked and we were on our way. During its first month of "live" testing, the member institutions exchanged more than three hundred questions, creating a virtual reference desk spanning three continents and fifteen time zones.

Pilot Three, which began in the late fall of 2000 and will continue through the end of this calendar year, focuses on scaling up the workflow, determining the needs for manual and automated back-up systems such as an "on-call librarian," and developing and implementing the knowledge base. The on-call librarian will not only ensure that no question is lost in the system but will provide technical support if CDRS goes down. The knowledge base will enable us to capture and reuse content.

From the beginning this has been a collaborative process in every sense of the word. Indeed, the rapid development of CDRS owes a lot to the resourcefulness and prescience of its early adopters. The volunteer advisory board, comprised of representatives from member institutions, meets regularly to discuss policy and future directions. Business meetings are also regularly held to get feedback, to report on and solve work flow problems, to discuss training and performance measures, and to build esprit de corps. The CDRS home page posts general information and news links, information for members, and project milestones. An electronic discussion list allows members to communicate freely and frequently with one another and get technical questions addressed.

The Whole Is Greater than the Sum of Its Parts

There are no restrictions on the types of libraries that can participate. The aforementioned SLA defines the nature of the member library's relationship to the CDRS and that agreement is codified in the library profiles. Many types of agreements are possible and are limited or expanded depending upon the strengths or limitations of the individual library. For example, a library may agree to: ask and answer questions; only ask questions; ask or answer questions only during specified periods; serve as an editor for the knowledge base; or serve as the on-call library if the automatic request manager function is inoperable.

In addition to defining roles and responsibilities among the partner libraries, the SLAs will ultimately be used to determine what it will cost a library to be a member of CDRS. The planners have been examining a variety of funding options with the goal of being as flexible as possible both to allow for the broadest participation among types of libraries and to ensure that no one library or group of libraries has to bear all of the costs of establishing and sustaining CDRS.

At the ALA Midwinter Meeting in Washington, the Library of Congress hosted a series of interactive sessions on cost models for library decision-makers. These sessions provided valuable information to the planners of CDRS, affirming support for CDRS and its mission to

have credentialed experts provide high quality information, and affirming a willingness to pay for such a service.

We have encouraged maximum flexibility in developing the component parts of CDRS. For a library to want to participate in CDRS, CDRS has to be perceived to have value. Just as there are no "one-size-fits-all" libraries, so too are there no "one-size-fits-all" arrangements with CDRS. Libraries are structured and organized differently, they have different local audiences, and they have different policies and procedures for ensuring quality control. It has to offer something that the library does not already have, for example, adequate staff, a subject strength, a special collection unique to a participating library that the whole collaboration then has access to. When the participating library defines the terms of that value, that library will have greater incentive to make the arrangement work, for itself and for CDRS. Our job is to create the tools; the library then decides for itself how to make the relationship work.

Where Do We Go from Here?

In January of this year, the Online Computer Library Center (OCLC) and the Library of Congress on behalf of its member libraries signed a cooperative agreement to guide CDRS through its next phase of development. According to the agreement, OCLC will provide technical and development support to CDRS by: building and maintaining a database of profiles of participating institutions that will provide answers through CDRS; building and maintaining a question-and-answer database system that will enable CDRS participants to catalog answers and store them in a searchable and browsable database; and providing administrative support for CDRS, including marketing, registration of new members, training, and user support. Together, the Library of Congress and OCLC expect to develop a viable model for a self-sustaining digital reference service and promote CDRS in the library community.

Currently, libraries participating in CDRS connect with other libraries on behalf of end users so that libraries can define the parameters, determine what works and what does not work, and create a service that is scalable and maximally responsive to user needs. From the beginning, however, we have envisioned CDRS as a service that is available directly to end users. We recognize that many individuals never go to their local library but still need information. And we want them to benefit from the power of a network of libraries that is dedicated to providing 24-7 reference service any time, anywhere. Over the next several months, CDRS will be developing a document delivery project to capture bibliographic information in the question-and-answer process that can be used to initiate an automatic interlibrary loan. This is the first step in building what we hope will be "one-stop shopping" for reference and information services.

CDRS will deliver the direct benefits of quality reference service to a broad spectrum of users any time anywhere, including expert knowledge navigation, a searchable archive of authoritative answers, and increased visibility and support for libraries everywhere. As we build the service, we are performing a number of behind-the-scenes analyses to ensure economic sustainability, such as creating a marketing plan to attract new customers and determining the most cost-effective means of administering the network. We are continually examining our technical solutions to ensure that we have the right ones to meet our mission, and that the tools we have created are easy for librarians to use. As we look to expand globally, and become a true 24-7 service, there are many issues we must examine: language and literacy; service to local populations in their own language; acceptable Internet access and technical infrastructure support mechanisms for a constituency that is the world; cultural and political sensitivities; and e-commerce and trade agreements that may affect pricing models. The solutions to these issues will determine the long-term success of CDRS.

The Genie Is Out of the Bottle

This paper has focused on the ways in which one group of libraries has used technology to link those in need with credible and accurate resources. CDRS is one of many experiments going on in the profession—innovative and creative projects designed more effectively to make information available faster and to meet more specialized demands.

Mark Twain would agree that reports of the death of libraries have been greatly exaggerated. Yet it is undeniably a watershed moment for our profession, a time to reinvent ourselves and to adapt our skills to the demands of the protean universe of information. At no other time in history has the emergence of technology affected so significantly the core mission of a library. These technological advances have created new opportunities for libraries, information managers, researchers, and library patrons of all kinds. Indeed, the Internet has created a fundamental change in the way people collect information and acquire knowledge. Instead of a trip to the library, researchers turn first to the Internet. The challenge for librarians is to leverage the excitement, power, and technology of the Internet to create resources and services that researchers will return to again and again.

Roles in Digital Reference

Michael McClennen
and Patricia Memmott

Over the course of the past five years, researchers and practitioners have demonstrated that digital reference services can indeed work well and have developed much of the necessary technology. The next step we must take is to figure out how to optimize the design and operation of our services. A useful step in this direction is the development of consensus models that describe the digital reference process. The authors have developed a model that describes the various roles played by participants in this process and the ways in which those roles interact. This model is illustrated by several case studies: the Internet Public Library, the Saskatchewan Provincial Library, and the Virtual Reference Desk network. The authors hope that the model will facilitate further research by providing a framework and terminology for discussion about the digital reference process. Furthermore, it may be useful to practitioners in the field who are engaged in designing and evaluating policies and procedures for digital reference.

Over the course of the past five years, the nascent field of digital reference has matured greatly. Early on, the primary goal was to demonstrate that online reference services could actually work, and to develop the technology necessary to do so. This initial goal has been achieved. There is now no doubt that digital reference can be very effective, and furthermore that services can work collaboratively and on a large scale. Several organizations, including our own project, have developed successful software tools for digital reference work.

The next step for digital reference research, as with any field in which the demonstration phase has passed, is to figure out how to optimize the design and operation of our services. In order to do this, it is necessary to develop consensus models that describe the digital reference process. Such models will serve as a common basis for discussion, and will also provide the degree of abstraction necessary for high-level reasoning about any system. They must be sufficiently generic to apply to the wide range of procedures that are used by various projects around the world, and at the same time specific enough to serve as the basis for concrete analysis and experimentation.

There are many facets to digital reference work that are amenable to modeling. In this paper, we will consider the roles that are played by the participants in the process. These roles define both the interaction between the various participants and their functions with respect to the operation of the service. Thus, they provide a good basis for future discussion and for the modeling of other facets of the field. One productive way to use these roles is as a basis for organizing the kinds of policy decisions that are necessary in order to develop a digital reference service.

The Model

Many of the decisions that go into building a digital reference service are ones with which librarians are already familiar: developing an efficient staffing schedule, offering a tiered versus nontiered service, setting up a system for keeping usage statistics, and so on. Librarians, in particular, have developed a great deal of experience over the years in creating reference service models that match the available resources and the needs of their community. Making the transition to the digital environment involves building on this expertise, while at the same time keeping in mind that the new environment imposes radically different conditions and raises important new questions.

One good way to consider these new constraints is to focus on the various roles played by participants in the digital reference process. These roles are familiar to those involved in the traditional reference process. Each has some new twists imposed by the digital environment and should not be considered to be exclusive. However, the separation helps us illustrate some of the issues that ought to be considered.

Patron

The fundamental role in the reference process is the asking of questions. Whether these individuals are referred to as "users," "customers," or "patrons" in the digital world, they require the same level of service as if they had walked in through a door, though providing much less information about themselves. In the classical model of reference, the patron interacts with a librarian in person or over the telephone, and can be thoroughly interviewed and ascertained to be a member of the community to be served. The librarian can respond to visual or voice cues—young or old, happy smile or disgruntled frown. The answer is delivered in person, thank-yous are duly received, and the transaction is promptly forgotten save as an entry in a log.

Michael McClennen (michaelm@umich.edu) is the Head of Systems for the Internet Public Library. **Patricia Memmott** (pmemmott@umich.edu) is the Reference Coordinator for the Internet Public Library.

The digital librarian, by contrast, receives a textual message by e-mail, Web, or chat. The librarian must determine, with a limited amount of context, who the patron is and what question they are really trying to ask. The patron may be located anywhere in the world, and may be of any age, gender, and profession. Even if asked directly, they may be reluctant to provide such information. Lacking such auxiliary cues, it is imperative that the "reference interview" represented by a Web form, e-mail template, or chat script be carefully designed to elicit enough information that the reference librarians can answer the patron's real question. One very useful technique is to ask the patrons how they are planning to use the information. In our experience, the answer to this question is invaluable in figuring out what the patron really wants to ask.

Once the answer is provided and sent back to the patron, further questions arise. 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-evaluation, as well as for generating archives of frequently asked questions and answers. However, this brings up concerns about privacy and intellectual property rights (which are extensive enough to be beyond the scope of this paper).

Given all of the problems of patron interaction in the digital world, there are at least a few advantages. First of all, the patrons have much greater access to digital services than to physically located ones. Depending upon its policy, a digital reference service can receive questions from anywhere in the world at any time. If a question cannot be answered locally, it can be forwarded to someone who can answer it. This gives the patron a better likelihood of getting a good quality answer. Use of the ever-growing world of digital resources allows the patron to view the same sources that the question-answerer used. In addition, our experience shows that patrons are more likely to ask questions that may be personally embarrassing to them via e-mail than they are in person.

Filterer

As we have noted, there are many characteristics of digital communication which serve to obstruct the flow of information between the person who asks a question and the person who answers it. On a large scale, these same characteristics are responsible for muddying the flow of incoming questions. The questions arriving at the in-box of a digital reference service are inevitably mixed with various kinds of non-questions, including: repeat questions, inquiries about previous transactions, questions that are unclear or out of scope, and out-and-out spam. These all need to be dealt with, one way or another, before the real questions can be answered. Some of this filtering can be done automatically, but there are always cases which require human judgment.

At the same time, there are steps that can be taken to improve the efficiency of the answering process. Stock answers can be sent to frequently asked questions. Questions can be categorized in various ways: by subject, by patron affiliation, by estimated degree of difficulty, and so on. Questions can be assigned to answerers, based on their capacity or known areas of expertise. If answerers are instead expected to select from the set of active questions, then the questions can be briefly summarized to aid in this process.

Advanced digital reference services, including the ones described below, assign one or more individuals specifically to carry out these tasks. These individuals are able to make judgments about the content of questions, including whether a given question falls within the scope of the service, and are able to identify repeat questions, even if worded slightly differently. They know how to identify questions that would be best referred to other services or that can be fulfilled by stock answers, asking patrons for clarification if necessary. Finally, they are able to categorize questions, which increases the efficiency of the answerers, and is also useful for later generation of statistical reports. Depending upon the policy of the service, the filterers can assign questions to individual answerers. All of these measures free the answerers to do what they do best: answer the real questions.

We, along with most of the other services described here, have found that the answerers perform best if they are not distracted by the operations of filtering. In addition, filtering often involves subtle questions of policy, thus requiring a higher level of judgment than answering. By separating out these functions, the staff members who are more experienced can carry out this role while those with less familiarity can play the role that requires fewer judgment calls.

Answerer

At base, the role of the answerer is the customary role of the reference librarian: assisting patrons with their information needs. This is easily the most time-consuming job in digital reference, and thus the core of any service. As with the other roles, there are substantial differences between working in a face-to-face setting and working in a digital environment. On the positive side, answerers are spared the weary task of answering "Where is the bathroom?" for the thousandth time. On the other hand, a never-ending flow of challenging questions makes the job much more intense than working the reference desk of your local library.

Without patrons waiting impatiently in front of the desk, it becomes important to specify standards for workflow. These include: how often should the in-box be checked; how much time should be spent, on average, in answering each question; how quickly should a response be returned. In theory, answerers can work anywhere they can get an Internet connection. This could range from a public reference desk (while not otherwise occupied), to a private office, to their own home. Different answerers may work best on different types of questions. For example, it may make sense to designate some answerers as subject specialists and others as generalists. Some may work best on locating sources while others excel at looking up specific answers. The possibilities are endless.

Once the answers are generated, the digital environment makes it possible to check and archive them. This is not a necessary part of a digital reference service, but can greatly enhance the quality of the service. Guidelines for the format and content of replies can be put in place and checked, and in appropriate contexts supervisors are able to review answers for accuracy and completeness. This can be very useful, for example, in training new staff members. Finally, questions and answers can be archived in a database for later retrieval either by the staff or by the public at large. As noted above, this can be valuable, but it also raises concerns about privacy and intellectual property rights.

Administrator

Any system which employs more than one or two people will inevitably require a certain amount of attention to smoothing the flow of work. This is the role of the administrator. While not as labor-intensive as the role of answerer, it is equally crucial. The tasks performed by administrators clear the way for the answerers and filterers to do their jobs properly. Equal parts problem-solver, policy-enforcer, and babysitter, administrators are the watchful eyes that keep service consistent and running smoothly on a daily basis.

In some cases, administrators may take on the role of making sure that every question is answered promptly. They may also be responsible for clean-up duties such as double-checking answers before or after sending them to patrons, transferring answered questions to archives, and collecting statistics about the operation of the service. There may also be low-level technical tasks that administrators could assume such as creating accounts for answerers, or monitoring the software used to operate the service in case glitches prevent patrons from submitting questions or answerers from accessing the system. The precise tasks that need to be done depend in large measure on the particular software and procedures used.

Coordinator

The final role necessary for the successful operation of a digital reference service is that of overseeing the "big picture." This is the role of the coordinators, who are responsible for defining and implementing the policies and procedures that make possible the operation of the service. This role may involve tasks such as: choosing software; setting down procedures and getting feedback about them from the rest of the staff; training new staff members; and making personnel decisions. This is in many ways similar to the role played by the coordinators or directors of any other reference service. The main difference that we have found in the digital world is that it is very important to have in place policies and procedures that are clear and well-understood. Whereas a librarian behind a typical reference desk can always fall back on instinct augmented by lessons from library school, the digital world presents many new issues that can not be handled informally in a satisfactory manner. Therefore, it is all the more important to be clear about who has primary responsibility for setting down the policies and ensuring that they are adhered to.

In order to make these decisions, coordinators need to stay up-to-date on the latest work on theory and practice in the digital reference community. A few years ago, this community was a relatively small one. With recent studies indicating that 45 percent of academic libraries and 12.5 percent of the public libraries in the United States are offering digital reference services, there is an increasing body of literature and opportunities for education.[1] Lastly, in order to keep their service viable in the long run, the coordinators must be able to articulate a vision for their service and market it successfully to management, staff, and patrons.

Case Studies

To illustrate how this model can be used in practice, we apply it to some real-world examples. We can characterize the services described below by detailing how each of the standard roles fits in to the particular reference process used by each service.

Case One: The Internet Public Library

This service is the one with which both authors are affiliated.[2] Since the inception of its online reference service in

1995, the Internet Public Library (IPL) has received more than forty-five thousand questions (see table 1 for a year-by-year breakdown). The process we use to answer questions is shaped by two factors: first, that we accept questions from the general public on nearly any topic; and second, that many of these questions are answered by library students and librarian volunteers. We have evolved a procedure that is aimed at making the best use of a small but highly trained paid staff by entrusting them with most of the difficult decisions and judgment calls. The much larger group of students and volunteers carry out the more straightforward—although still challenging—job of answering questions.

The patrons of the IPL come from all over the world, and range from schoolchildren to executives. In order to make the best of our limited communication channel, we have designed an extensive Web form that asks the patrons for information about themselves and their question. We have found over the years that this helps us to provide the patrons with the best possible answers. However, there is a negative side to this issue as well. In order to generate an archive of answered questions and at the same time preserve the privacy of our patrons, we must strip out all personal information before the questions are archived. Much of this can be done automatically, but some patrons insist on including personal information in the text of their question, and we have been unable to identify any way to extract this other than manual editing.

The roles of filterer and administrator are those which require the most training and skill. Accordingly, we have tended to combine these jobs together. Our most experienced staff are the ones who handle a question at both the beginning and end of its life cycle. We have developed written policies and procedures, including guidelines for making the necessary decisions regarding which questions to accept, reject, or refer. At the same time, our best filterers have been those who have strong customer service skills, along with the ability to make sensible decisions about how to handle questions which fall into gray areas. We affectionately refer to our filterers as "muckers," since the job of working through a very full in-box can be compared to wading for hours through muck. In order to ease the monotony, they periodically switch to the somewhat easier task of reviewing and archiving answers, and forwarding thank-you notes to the answerers. One person is put in charge of the service for each twenty-four-hour period; they have the responsibility of making sure that every question is answered in a timely manner, and that we do not accept more questions than we have the resources available to answer.

The work of answering the questions is performed by a large, diverse, and geographically widespread group of people. Because they are for the most part doing this in their spare time, we cannot rely on specific levels of performance. At the same time, our domain of knowledge is so broad that we cannot assign questions based on prior knowledge of subject expertise. Rather, we post the available questions and allow the answerers to choose the ones they wish to work on. Those answerers who have specific goals (such as students whose coursework involves answering questions for us) can be tracked over time to determine whether those goals have been met. We have developed written guidelines for the answering process, but as a precaution each answer is reviewed by an administrator, and a correction or follow-up sent if necessary.

Table 1. Questions Received by the Internet Public Library, August 1995–March 2001

Year	Questions Received
1995	1,680
1996	5,687
1997	7,425
1998	8,709
1999	9,735
2000	9,709
Jan.–Mar. 2001	2,787
Total	**45,732**

The coordination of a service such as ours is definitely a full-time job. The duties include recruiting, training, and supervising the filterers, administrators, and answerers who keep the service operating on a daily basis; updating the written policies and procedures in response to new situations; generating and interpreting statistical reports; and taking a turn at the other three jobs in order to keep abreast of current issues as they come up. The coordinator is also responsible for handling problem patrons, making sure that extremely difficult questions are dealt with, and finding ways to control question volume.

Case Two: Saskatchewan Libraries: *Ask Us!*

Our familiarity with the procedures used by the Saskatchewan Libraries: *Ask Us!* online reference service is based on our role as consultants in helping to set up this service.[3] It has been operating since January 2000, and has answered approximately fifty to seventy-five questions per month.[4] Because it is operated by a geographically focused institution, the character of the service is much different than that of the IPL.

The patrons of this service fall into two classes: patrons of the Saskatchewan library system who have general questions, and people from outside the province who have questions about Saskatchewan. In order to

most efficiently serve the former group, the patrons are asked to provide their postal code. The province is divided into ten library regions, and this allows each question to be directed to the patron's regional main library. Many of the questions received by this service concern the availability of books and other services at the patron's local library, and they are thus assured that the question will be looked at first by a librarian from the same region. Questions from outside Saskatchewan are put into a separate pool which is checked by all of the librarians.

Because of the relatively small volume of questions and the fact that all of the staff are trained librarians, the roles of filterer, answerer, and administrator are combined. The staff of each regional library is free to distribute responsibility in any way they choose, but the typical procedure is for a single librarian to handle a question from start to finish. Occasionally the original librarian is unable to answer the question, and will refer it to another regional library or to a shared "stumpers" question pool. The coordinator of the service works for the provincial library, and works with a liaison from each regional library to set common policies.

Case Three: Virtual Reference Desk Network

Sponsored by the U.S. Department of Education, the Virtual Reference Desk (VRD) project works to support digital reference services of all varieties (library-based and expert-based) in their efforts to provide human-mediated, Internet-based information services to specific communities or the general public.[5] One of the services that this project provides is the VRD Network, to which participating digital reference services can submit out-of-scope and overflow questions.[6] These questions are then routed to another participating service, or are answered "in-house" by VRD staff members or volunteer information specialists (mainly librarians and library school students.) Since it began operating in January 2000, the network has received 4,231 questions, of which 75 percent were answered in-house.[7] This kind of collaboration among digital reference services makes a useful case study, particularly for other organizations who may be contemplating starting similar cooperative efforts to exchange or redistribute questions.

The majority of the patrons who are served by the network are referrals from the various participating services. A small number of patrons write directly to the network, often because they had previously had a question answered in-house by a VRD information specialist. As such, the patrons are a diverse group, and little information may be known about them. It is up to each referring service to determine how much information to collect about the patron, and some collect more than others. Privacy issues are important in collaborative ventures such as these. Participating services, for example, must be aware of their responsibility to alert patrons of the possibility that their question might be forwarded to another service. The network also has to be protective of patron privacy when adding questions that are answered in-house to their own archive of questions and answers.

A relatively small operation, the VRD Network dedicates only one full-time staff member and one part-time staff member to the tasks involved in operating the service. The roles of filterer and administrator are combined, and are handled on an alternating monthly basis by the two staff members. The filtering tasks carried out each day include sorting through the incoming questions, selecting which questions to refer to participating services or to an information specialist, and notifying patrons of the status of their question. Some of the daily administrative tasks include spot-checking in-house answers, and editing and archiving answered questions. Having the more highly trained staff handle these more complicated tasks allows the volunteer information specialists to focus on the role of answerer. Answerers are first trained to ensure that their answers comply with service policies, and are then placed on duty on an every-other-month basis. Once an answerer has completed a question, they are sent a new question, at the rate of about two to three questions per week per volunteer. VRD staff members assist in answering questions, too, as their time permits. Services which submit questions to the network are required to answer any questions which get routed to them, but there are no specific policies as to the type of answer they must provide, nor a specific time limit.

The role of coordinator is handled by the network's full-time staff member, Blythe Bennett, outside of her filtering, administering, and answering duties. Coordinating a collaborative effort on this scale is not a simple task. The service needs to recruit and train volunteers to serve as information specialists, develop and maintain policies and procedures for answering and routing questions, and nurture relationships with the participating services and potential participants.

Uses of the Model

We hope that the model described here will facilitate further research by providing a framework and terminology for discussion about the digital reference process. With further work, it may be possible to develop a comprehensive process model for digital reference.

This model can be used to facilitate the practice of digital reference in a number of different ways. Perhaps its most important use is in the development of written policies and procedures. We have found that it is helpful to organize these by role. This helps to clarify the interactions

between roles, and to help each participant in the reference process understand what is expected of them. At the same time, if the written guidelines cover the major aspects of each role, they can be assumed to be reasonably complete.

Another area in which this model can be of use is in the choice of software for coordinating the operation of a digital reference service. This choice is critical to the success of such a service, in that the software must be able to facilitate each person's work in carrying out his or her role in the process. One good way to evaluate such software is thus to examine it from the point of view of each role. The question to ask is: does the software provide the functionality necessary to enable each person to carry out the tasks assigned to their role, in accordance with the procedures that have been established? In addition, the software must provide efficient channels for communication between the participants. This includes not only communication between the patron and the librarian, but also between the librarians in their various roles.

Finally, the model can be useful in evaluating the performance of a service and identifying bottlenecks. If accurate statistics are kept regarding the actions taken under each role in the process, one can determine where improvements in the procedures associated with each role might enhance the throughput of the entire service.

Conclusion

We have described a model that delineates five roles involved in the digital reference process and have described some of the aspects of each role. Compared to traditional desk reference, the digital environment presents novel challenges. However, it also allows for increased efficiency by letting staff members focus on one aspect of the job at a time. We found during the course of developing our own digital reference service 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. We hope that this new model will provide a basis for further discussion and research about the process of digital reference and will also provide a framework upon which decisions about digital reference practice can be made.

Our experience with digital reference shows that running a successful service depends upon having clearly defined policies and procedures that are well understood by all the participants. By framing these policies and procedures in light of these roles and the interactions between roles, one can ensure that all necessary aspects of the service have been covered and that everyone knows which roles they have been assigned to play. As is the case in so many domains, having an appropriate terminology on which to base discussion and decision contributes greatly to the effectiveness of the results.

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We'll Take it from Here: Further Developments We'd Like to See in Virtual Reference Software

Steve Coffman

Virtual reference services—providing patrons with live, real-time reference over the Web—have suddenly become a very popular topic in the library community. Any conference program with "virtual reference" or "digital reference" or "24/7" or any of the variety of other euphemisms we use for live, online reference on the Web, is guaranteed to be packed. New electronic discussion lists and discussion groups are popping up like mushrooms. The first articles on the subject have already appeared in American Libraries *and* Library Journal, *and dozens more are being churned out as we speak. But even more telling are the numbers of libraries that have actually begun to implement it. In September 1999, there were no more than five libraries that had implemented any kind of live virtual reference service, or that even knew what it was. Today, less than eighteen months later, there are over two hundred libraries from all over the world that have started offering live online reference in one guise or another, and more are joining the fray everyday.*

Of the more than two hundred libraries worldwide that have started offering live online reference services, only a few have tried to develop their own versions of virtual reference software—often based on an existing chat application of some sort. Most have chosen to go with one of the many commercially available applications like eGain Live, Cisco's Webline, LivePerson, Humanclick, or a number of others—all of which were originally designed to allow e-commerce companies to provide live interactive customer service over the Web. And all of us have been struggling—with varying degrees of success—to take these commercial customer service applications and modify them for library reference purposes. As the Product Development Manager for LSSI's Virtual Reference software, I am a veteran of those struggles, and have the scars to prove it. Over the past two years now, I have worked to adapt a number of commercial e-commerce applications for reference purposes, and it has not always been an easy process.

On the surface, answering a customer's questions about a pair of denim jeans and answering a patron's question about the etymology of the word denim (or anything else) would seem to have much in common. In reality, however, there are some pretty fundamental differences between online customer service and online reference and the software that is necessary to support it. In the first place, customer inquires about denim jeans or any other product can almost always be answered with information from the company Web site alone. So as long as the software works well with the company Web site, there is no problem, at least for the e-commerce people.

But that is hardly the case in reference. To answer the question about the etymology of denim (it comes from *de Nîmes* or "from Nîmes," France, by the way, for those who were dying to know), a librarian might want to check at least one or two good etymological dictionaries and perhaps a few other resources, none of which are actually part of the library's own Web site. And the next reference question is likely to require browsing a whole different set of resources. So the software that needs only work well with the company's site when used in e-commerce applications must be compatible with thousands, perhaps even hundreds of thousands, of other resources when it is used for reference. And there are plenty of other difficulties too. These software packages lack a good "on-hold" function because it assumes that a customer service rep will be able to quickly answer a question and move on to the next one without significant delay. True enough, when you are answering a question about a pair of jeans but not when you are a librarian browsing all over the Web looking for the answer to a reference question while the patron waits. And while the built-in knowledge bases that come with many of these packages may work quite effectively for answering product questions where there are a limited number of facts about a limited number of items, they have not performed well in library reference work where there can be almost infinite numbers of questions and answers.

The list of shortcomings could go on and on. It is important to note, however, that despite their limitations, commercial Web-based customer service applications are still the best resource available to libraries that want to venture into virtual reference on the Web. By adapting these existing applications instead of going it alone, we have been able to leverage millions of dollars in investment flowing into the e-commerce arena and take advantage of it for our own purposes. As a result, libraries now have access to applications that offer functionality and refinement far beyond anything we could have developed by ourselves. And the best of the Web customer service applications on the market offer a whole suite of interactive technologies that have proved very useful for live, online reference. Among the best applications featured are the following:

- full two-way co-browsing (you can see what the patron sees, and visa versa);

Steve Coffman (coffmanfyi@earthlink.net) is Product Development Manager, Virtual Reference Services, at Library Systems and Services, LLC (LSSI).

- form-sharing (the ability to share search strategies and other text in Web forms);
- the ability to share files and slideshows with a patron;
- scripted messages and bookmarks to help handle routine functions and requests;
- basic knowledge bases;
- logging and capture of reference sessions for future analysis;
- full session transcripts e-mailed to both the patron and librarian;
- queuing and routing of incoming questions; and
- the ability to conference or transfer a call with other libraries on the system.

So, while commercial Web customer service software is hardly perfect, it does provide a good foundation upon which we can build the new virtual reference systems we will use tomorrow. The question now becomes, where do we take it from here? What changes and refinements will we need to make to this software, and what new functions and systems will we need to develop to build virtual reference applications that will more effectively meet the needs of libraries on the Web.

There are no definitive answers here of course, and virtual reference systems will always be a work in progress, just like any other software. However, based on a few years experience with the current software, I think we've got a pretty good idea of where some of our biggest problems are and the issues we should be tackling first. Here's what's on our short list at LSSI—and from my conversations with others working in this field, these are problems and frustrations shared by us all.

Co-Browsing and Collaboration

In general the co-browsing and collaborative capabilities of Web-based customer service software need to be significantly improved for virtual reference systems. The fundamental problem is that to be truly effective, virtual reference systems must be able to escort the patron anywhere on the Web—most particularly through those proprietary databases we subscribe to. We are spending a lot of money on those databases and it would be nice if we could use the virtual reference software to show our patrons how to use them more effectively. Unfortunately, none of the existing software works with more than a few of our databases right out of the box. Proxy-server-based co-browsing like that used in LSSI Interact software and Cisco's Dynamic Content Adapter—where a single computer does the browsing and sends the content back to all the parties on a session—seems to be the best solution to this problem. But there are still many databases that cannot be co-browsed effectively even with proxy-server-based systems. Each problem database needs to tackled and resolved on a case-by-case basis—and those of us who are developing software in the field are gradually working through the problem databases one by one. But it is an arduous process, and while we are making progress, there is still a long way to go. We would also like to see a tighter integration between the database and virtual reference in other areas as well. For example, it would be nice if the database producers could include a virtual reference link on all pages of their database—something that might say "Didn't find what you were looking for? Click here for help," a sort of "point of need" button the patron could click on to access a librarian anytime they needed help.

In addition to being able to co-browse a broader range of our databases we would also like to see some enhancements to the collaborative tools available in a reference session. For example, it would be nice to have a "virtual marker" that could be used to highlight words, phrases, and passages of a Web page we sent to the patron. It would also be nice if we could scroll the patron's screen. Most applications only allow you to send the Web page, not scroll it up and down for the patron.

Communication

The communications technology is another area that could use some improvement for virtual reference purposes. Right now, most live customer service software uses chat as the primary method of communication between the agent and the customer. While it is better than nothing, chat leaves something to be desired as a communications tool for almost any function, but particularly for reference, where the ability to conduct an effective reference interview requires careful attention to nuances of voice and inflection that are lost in chat. Moreover chat is much more time-consuming than regular voice communication because you have to type everything out—and then you have spelling and typing errors that can creep in and make even the best of us look like fools.

For all of these reasons and more, it is hoped that chat is an interim technology which will soon give way to something much more humane like voice. Indeed, this transition seems to be already well underway. Many people already have two telephone lines or high-speed Internet connections using cable or DSL and in these cases, of course, it is already possible to speak with the patron over the phone while using the virtual reference software to handle the co-browsing on the Web. But for those people who do not yet have access to a second phone line, the answer seems to be Voice over Internet Protocol (VoIP).

VoIP is a developing Internet protocol that allows both voice and data to be passed over the same Internet connection. In a VoIP session, a librarian and a patron would co-browse the Web and talk with each other either using headsets plugged directly into their computers, or by using the built-in microphone and speakers that now come standard on many PCs. While studies show that many PCs installed in people's homes and offices are VoIP capable, for some reason very few people take advantage of that feature as of yet. This is likely to change over the next few years as the network gets faster, voice quality improves, and people begin to explore the technology as a way of making cheap long distance phone calls.

One potential downside to relying on voice instead of chat in virtual reference is the risk of losing that nice chat transcript that gives such insight into the reference process. However, it is possible to capture the voice as a sound file and to store the Web pages pushed during the session along with it. The problem is that analyzing sound files would be a good deal more cumbersome and tedious than reviewing chat transcripts—and that is tedious enough. Perhaps the best solution would be to explore ways of using voice-to-text software to convert voice records to searchable text files that could be analyzed much as we are using chat transcripts now.

Networked Reference Services

One of the greatest potentials of the new virtual reference software is that it could serve as a very effective platform for the development of shared and networked reference services. Up until now, reference has been a pretty insular activity with each library basically handling its own questions as best it could. That method works just fine for routine reference questions that can be easily answered within the expertise and resources of the local library, but it breaks down as soon as you get a "zinger" that can't be answered effectively with your own resources. In those cases, it would be nice if the question could be simply and easily transferred to somebody with the resources and expertise to answer it. The problem is that we have never had the technology that allows us to quickly and easily transfer and share questions among one another. Virtual reference software has the potential to change all of that. The software allows the transfer of calls or conferences with librarians from any library using the system and it can be done live, in real-time while the patron is still online. So we now have the basic network structure that makes it possible to share reference, but there is still a lot of work that needs to be done before libraries can really take advantage of this new capability.

One thing needed is a good question tracking and routing system that will help us keep track of who is handing a question for whom, what its status is, what time and costs were required to answer it, and whose account it should be charged to. The Collaborative Digital Reference Service at the Library of Congress has done some initial work in this area, but much remains to be done. We also need to look at some sort of standardized record format for the questions themselves so they can easily be passed back and forth between libraries using different virtual reference systems, just as the MARC record allows us to interchange bibliographic data between libraries using different automated systems.

Finally, once we have this infrastructure in place, libraries can be expected to begin developing specialized reference services that they will offer to others on a subscription basis. For example, it is easy to imagine a library with a strong business reference service using the virtual reference software to make that service available to other libraries on a subscription basis. Librarians at subscribing libraries could either transfer calls to the business reference service or patrons could be routed directly to the business reference service from a live link on the subscribing library's Web page. Business is just one of the many specialized subject areas where subscription reference services would make sense. Other obvious fields include law, medicine, sci/tech, statistics, foreign language reference services, and a number of other specialties that we "general practitioner" librarians often have difficulty with.

Online Reference Collections and Knowledge Bases

One of the things that distinguishes libraries from other sources of information on the Web is that we provide access to current, authoritative, and unbiased data in a wide variety of subject areas. The problem is that a great deal of that information is still locked up in our print reference collections and not available over the Web. So, if we are serious about moving reference to the Web, it is high time we began to work with the major reference publishers to begin to move some of those key resources to the Web. And it is not just a matter of making an electronic replica of the print source; the Web allows us to use these resources in ways we never could in print. At a very minimum, we should be looking at developing a reference search engine that allows us to keyword-search the full text of our entire electronic reference collection regardless of which publisher created the source. Plus, our electronic reference sources should be able to learn and improve as we use them to answer questions. For example, librarians should be able to bookmark or annotate the sources to help others find the answers to difficult questions more easily, and we should also be able to refer

others from a source to supplemental material we may have found in answering a reference question. So when somebody listed in one of our biographical dictionaries dies, for example, we should be able to annotate the entry with their obituary plus references to the spate of articles that typically appear after their demise. If we could incorporate some of these ideas, our reference collections would no longer be just a static collections of sources, they would be living and breathing things which would develop and improve as we worked with them. The ideas here are not entirely new; you can begin to see the result of the first efforts to develop some of these new reference tools in products like Xrefer (www.xrefer.com) where a variety of core reference sources are searchable in a single search engine. This is a step in the right direction, but much remains to be done.

We also need to take another look at licensing, especially for reference purposes. Most standard license arrangements for electronic resources are based either on FTE or on simultaneous users, where the assumption is that patrons will be accessing these resources online all on their own. This works all right for general purposes, but it falls down when the resources are used for virtual reference. In the first place, how do you count collaborative browsing? Does each party on a session count as one simultaneous user? Or does each virtual session count as one? But, more importantly, current licensing arrangements tend to overstate the value of reference sources that are not used heavily. We believe it is time we got together with the publishers and see if we could come up with a licensing arrangement specifically for virtual reference where the librarian and the patron were sharing the resource in a virtual reference session. This could help us address the issue of what counts as a simultaneous user and also help insure that some of our less commonly used reference material was available at a more moderate price. This sort of reference licensing could also give librarians an opportunity to try out a resource for reference purposes, and if it proved popular, they could then license it for direct patron use at a higher cost. This is not just idle speculation. LSSI is currently working with a number of reference publishers to develop exactly this sort of specialized licensing for virtual reference—and hopefully these efforts will bear fruit.

Finally, it is about time we realized that reference publishers are not the only sources of content for our reference collections. In fact, librarians create what is potentially some of the best and most useful content every time we work out the answer to a reference question. We all know that questions recur, and if we could somehow access the work another librarian had done before, there would be no need to start over answering every question from scratch. The problem is that up until now there has been no easy way to preserve our work, so our efforts vanished with the patrons as they strolled out the door. Now, for the first time, the virtual reference software has given us the tools to capture and preserve the reference content each of us is creating on a daily basis. The software records and preserves a complete transcript of every reference session including all of the chat conversation between the librarian and the patron as well as the titles and addresses of all Web pages pushed, and files, slides, and other content that was transferred during the session. And it does it all automatically. There is nothing the librarian has to do—not even make a hash mark.

Of course, now that we've finally got this information, the question is, what are we going to do with it? People have only just now begun to experiment with this transaction data, but several possible ways of using it seem to be shaping up.

The simplest approach is to use elements from the transcripts of previous questions as a sort of crude FAQ so you can run new questions through to see if they have already been answered. You can see one such system in operation at WebHelp (www.webhelp.com), a major commercial reference service. When you type in your question at WebHelp it automatically runs a keyword search against all of the other question transcripts in its archives, and brings back a list of possible matches from previous questions asked on the system. If you don't find your answer within those results, you can then click on the button to get live help. The system has its limitations—people can ask questions in many different ways so there are quite a few duplicates, and the list of Web pages pushed appears without any context since the chat transcript is not displayed to preserve customer privacy. But there are some great advantages as well: the entire FAQ can be produced automatically so you don't have to wait for answers to written, edited, and published as in a more formal knowledge base, and new questions are available for searching immediately. So, if you suddenly get a run on a very current question because of something that has appeared in the news (for example, What is mad cow disease?) there is a strong likelihood that patrons may be able to find the answer to the question in your automatic FAQ before they ever reach you.

The next step up would be to take the raw content in those saved reference transcripts and use it to create a more formalized knowledge base. As mentioned earlier, many of the commercial customer services applications come with a basic knowledge base of some sort already built-in. While those knowledge bases may be adequate for commercial purposes, they are woefully inadequate to meet our needs in reference where we must figure out ways to store, retrieve, and maintain what could easily be millions of records. There are a number of parties that have begun to examine this issue, but nobody has yet been able to demonstrate a system that will effectively answer a very broad range of reference questions without frustrating both the librarian and the patron. One of the

largest attempts to come up with a similar system on the commercial side was the AskJeeves search engine, and anybody who has used that knows the limitations of very large knowledge bases.

Finally, we can analyze the raw transcripts and see what we can learn from them about how people are using our reference services and the kinds of questions they are asking. Ultimately the objective is to anticipate our patrons' questions and to design our library Web sites and electronic collections so that most patrons can easily find the information they need without having to ask. This one is a no-brainer, and many libraries have already begun reviewing their transcripts to see what lessons they can glean from them. At this point, this is pretty much a manual process, and that will work fine as long as there are a modest number of transcripts. As reference volume increases, however, it will be difficult to continue this sort of analysis by hand, and we will need to take a look at some of the software applications used to process and analyze large data warehouses and information stores in the commercial world.

Those are some of the developments you can expect to see in virtual reference software over the next one-to-two years as we work to take something that was originally built for selling sweaters, stocks, and vacation packages, and transform it into something we can use to help people find the information they need. This is hardly an exhaustive list (and doubtless many of you could suggest things that should be added) yet it is a very tall order, even as it stands. It is a very good thing, then, that so many wonderful, enthusiastic, and energetic librarians have been jumping into this field in recent months. As you can see, we have a whole lot of work to do, and if we are to be successful, it will require every bit of commitment, enthusiasm, and energy we can muster—and then some. But if we are successful, we will have done much more than just create a new piece of software; we will have made a set of tools that promises to fundamentally change the face of reference as we have known it. Now, let's get going.

Using Macromedia Authorware for Web-Based Instruction

Kevin F. Cullen

Macromedia Authorware is a tool for creating computer-based instruction programs which are more interactive than standard Web pages. Authorware has been extended to allow Web delivery of programs created with it, but there is little literature regarding use of Authorware's Web features. The Colorado State University (CSU) Libraries have created a media-rich library skills tutorial using Authorware and have learned enough to evaluate its potential for Web delivery.

Macromedia Authorware has long been used to create multimedia computer-based training (CBT) programs which are delivered via CD-ROM or LAN. Several years ago, Authorware was given the ability to deliver CBT packages via the Web, though little literature exists about this function. The CSU Libraries have created a Web-based training (WBT) package with Authorware and have learned a great deal about the limitations, advantages, and implications of delivering Macromedia Authorware programs via the Web. This article discusses these lessons and is designed to help teachers and trainers decide whether Authorware Web-based training is suitable for their situations.

The CSU Libraries set out in 1999 to create a truly interactive tutorial. The product that emerged was the Data Game, a Web-based library tutorial which incorporates Flash animations, voice-overs, a soundtrack, and still graphics.[1] Authorware is the framework that bundles it all together and provides navigation, interactivity, and quizzing functions.

As the Data Game project started, the librarians involved had great difficulty deciding what was possible and discerning what various software tools were capable of. Software companies describe their products with meaningless buzzwords and jargon, making it hard to know what these tools can do. The more the librarians read, the more questions they had and the more frustrated they grew.

Because the CSU Libraries wanted something dramatic, interactive, and media-rich, they selected Authorware as the main delivery tool, based on what little information they found. Authoring packages like Authorware and Toolbook are outside the consumer mainstream and are rarely reviewed in the computing press. Authorware has been around for many years and is powerful, yet few have heard about it. Fewer still are using its Web-delivery capabilities. Once staff at the CSU Libraries began Authorware training, they were pleased to discover what it really is: a tool that allows a creator to arrange images, text, movies, sound, and animation files along an interactive timeline, and to intersperse these media with built-in interactivity, including multiple-choice questions, check boxes, and text-entry fields.

Authorware: The Tool and Its History

Authorware was released in 1987 by a company of the same name as a CBT authoring tool for the Macintosh. By 1991, Authorware had merged with Macromind to form Macromedia, and Authorware had become a Windows-native application.[2] In 1996, Macromedia added basic Web-delivery features to Authorware, though they emphasized its use over intranets rather than the Internet.[3] While there were once many media and CBT authoring tools available, Authorware's main surviving rival is click2learn's Toolbook. Most similar programs seem to have dropped out of the market and are being replaced by HTML-based environments such as WebCT and Blackboard, though these do not have the same number of features and measure of control as Authorware.

Authorware is an expensive tool. The commercial version of Authorware 5.2 retails for $2700 U.S., while Macromedia's Web Learning Studio, including the Dreamweaver HTML editor, Flash (an animation tool) and the full version of Authorware, is available for a discounted academic price of $799.

Authorware Advantages

Authorware has many advantages over presentation programs like PowerPoint, "point and click" HTML tutorials, and even Web sites enhanced with Flash animation. It allows the user to navigate through lessons, and it integrates interactions. Authorware interactions can test a user's knowledge and can be programmed to react differently based on the user's response.[4] These interactions include multiple-choice and fill-in-the-blank questions, matching exercises, clickable "hot spots," and drag-and-drop activities. Authorware's flow-line based development environment and proprietary programming language allow the developer to make a project as linear or complex as desired.[5]

Authorware was designed to create stand-alone, executable programs without the need for a special player. When created properly, a standard Authorware program can be run on both Windows and Macintosh operating systems with no modifications. An Authorware CBT is a compiled program, and the end user has no access to the source code. If packaged correctly, even another Authorware

Kevin F. Cullen is the Digital Projects Librarian at Colorado State University.

developer cannot open and modify an Authorware CBT. Authorware packages appear in their own application window and can have their own title bar and drop-down menus.

One of Authorware's strongest points is its ability to include many types of media, including Flash animations; JPG, GIF, BMP, and TIF bitmaps; AVI and Quicktime movies; AVI, WAV, and MP3 sounds; and ASCII and RTF text. Authorware has built-in Open Database Connectivity (ODBC) capabilities and can communicate with databases via Structured Query Language (SQL). It can also send results to AICC-compliant Learning Management Systems (LMS), allowing instructors to track scores, student participation, and other factors.[6]

The learning curve for Authorware is hard to describe, although Niemayer notes that "Most critics said that Authorware requires a lot of time to learn, but they also maintained that it is not difficult to learn."[7] In the CSU Libraries experience, Authorware takes time to learn because there are so many features and no similar commonly used applications to provide a point of reference. Discussions on the Authorware developer's newsgroup (macromedia.authorware) often compare the Authorware platform to other tools. Most Authorware developers seem to think that Authorware's icon and flow-line based development are much simpler and faster for large projects than Flash or Visual Basic. While savings in developer time may justify Authorware's high price compared to other products, developing a fully interactive, media-rich WBT is not cheap.[8]

Technical Considerations

Using Authorware to create CBTs and WBTs has a number of technical implications. When delivered by CD-ROM, hard disk, or file server, an

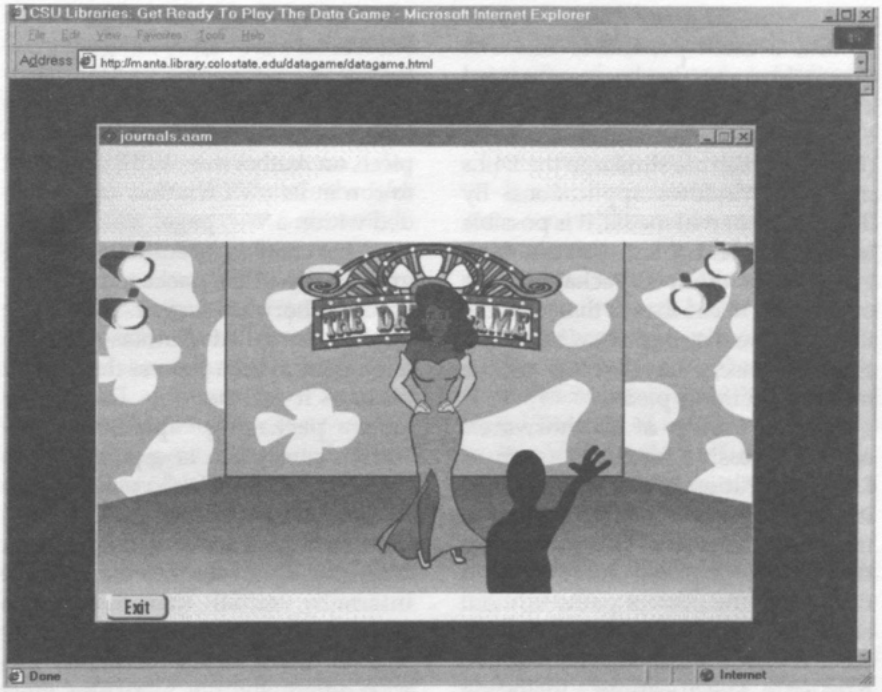

Figure 1. Authorware Web View of the CSU Libraries' Data Game

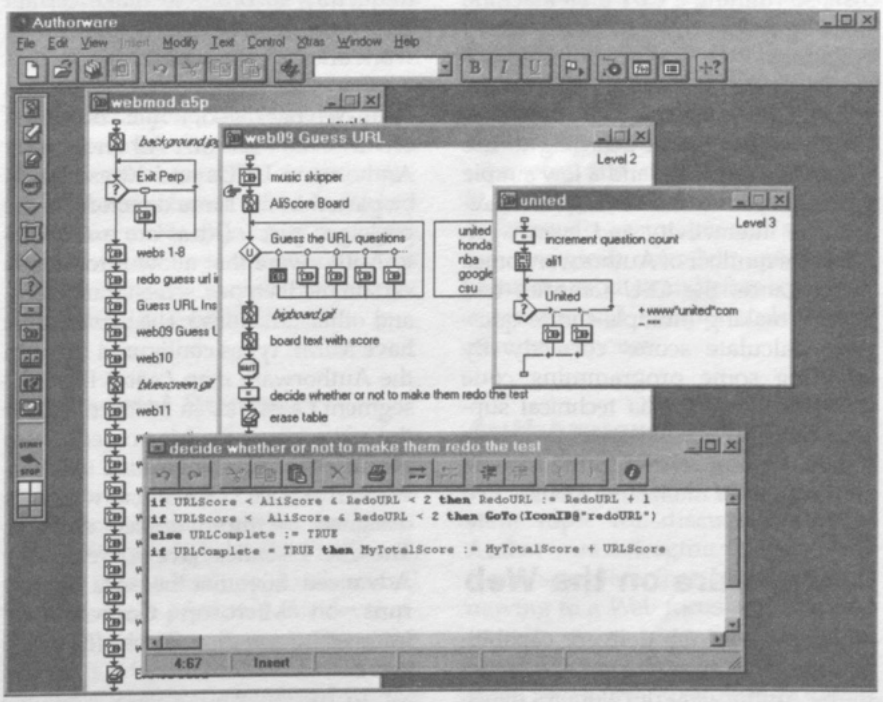

Figure 2. Authorware Programming

Authorware program always revolves around a main executable file. The executable may also be accompanied by linked external media and helper libraries called user code documents (UCDs), which are similar to the DLLs used by Windows applications. By linking to external media, it is possible to update text files, sounds, and graphics without repackaging the entire CBT. It also means that all of the files must be distributed together, and that end users have access to the media used in the piece.

To use some of Authorware's most impressive functions (such as LMS integration or SQL commands) it is best to run the final CBT in a controlled environment. This guarantees that calls to external databases and files go to the correct paths without creating error messages. It also ensures that the user has the required hardware specifications, including minimum processor, RAM, and monitor resolution. Authorware often needs to write files to the user's hard disk, so running a CBT on a machine with tight security can cause access violations.

To get the most out of Authorware, a developer must use its built-in programming language. Learning to use variables, operators, and a few simple functions allows the developer to create true interactivity and even work around a number of Authorware bugs. For instance, the CSU Libraries had trouble making multiple-choice questions calculate scores correctly. By adapting some programming code from the Macromedia technical support Web site, programmers were able to avoid a bug related to the naming conventions of interaction icons.

Authorware on the Web

Authorware's Web delivery capabilities receive a great deal of discussion in the Authorware developer's newsgroup. Web delivery was added nine years after the product was first developed, and documentation on Web features is still inadequate. By version 5.2, Authorware had become a powerful, yet temperamental tool for developing WBTs. Depending on the HTML used to call the Authorware piece, an Authorware WBT can be set to run in its own window or embedded within a Web page.

After creating an Authorware program, it must be packaged in standard Authorware format. A separate application called Authorware Web Packager can then process the file and package it for the Web. During the Web packaging process, the Authorware piece is separated into segment files. The Web packager also creates a single map file, which summarizes the contents of the segment files. Placing media into the package internally, rather than linking to external files, can make Web delivery simpler. If media files are not packaged internally, the map files must often be edited to point to the external media. It is best to test Web delivery early in the development process and frequently, in order to make certain that each feature in a project will work once it is Web packaged.

Once the Authorware piece has been Web packaged, it must be placed on a Web server. All necessary Authorware UCDs and Xtras should be placed in the same directory as the packaged piece. (Xtras are extensions to Authorware that allow it to handle certain media types, screen transitions, and other functions.) The server must have MIME types configured for both the Authorware map (.aam) files and segment (.aas) files in order to deliver the piece correctly. Macromedia also produces a program called Authorware Advanced Streamer, which is designed to improve Web delivery. The CSU Libraries have not tested the Advanced Streamer because it only runs on Microsoft Corporations' Internet Information Server (IIS) Web server.

To run an Authorware WBT, the end user must have the free Authorware Web Player installed. The full version of the Web player is 4.4MB, a fact that discourages some people investigating Authorware as a WBT development platform. While an 832K compact version of the Web player exists, it contains few of the Authorware Xtras needed to run most packages. This forces the developer to have lines in the map file that try to push the necessary Xtras to the user. Pushing Xtras to many machines can cause security violations.

The Web player first downloads the map file to read instructions and then waits for the segment files to come in sequence. It begins playing the segments in order, and hesitates if not enough segments have been downloaded to progress further. This simulates the true streaming process used to serve many media applications on the Web.

Web Delivery Problems

As mentioned earlier, Authorware's most powerful functions work best in a controlled environment. The Web is obviously not a controlled environment, and delivering Authorware WBTs can give rise to a number of problems.

The most serious issue that arose from Web delivery of the Data Game was related to the Authorware Web Player's security features. The Web player can run any piece in one of two modes: "trusting" and "nontrusting." Nontrusting mode is designed to protect the user from viruses and other potential security risks. Running a piece in nontrusting mode disables a number of internal Authorware functions and variables, as well as the ability to read external files from the Web server. It also prevents the piece from downloading UCDs that may be necessary to carry out a number of tasks such as e-mailing results of a quiz.

Authorware map files may be edited to launch a security dialog box that prompts the end user to run the piece in trusting mode. If the user agrees to run the piece in trusting mode, the Web Player will be able to

run restricted functions and use restricted variables. The Web Player will also attempt to download any necessary UCDs, though the end user's machine may not give Web Player disk-write privileges. In the case of the Data Game, many computer labs at CSU had computers with Windows NT security restrictions that prevented a UCD from copying to the local disk. This created Windows NT security warnings when students tried to use certain parts of the Data Game.

Because the Data Game relies heavily on Flash animations to deliver content, its developers discovered a problem with the Web Player. Many machines in the library's Electronic Information Center were having trouble running our Authorware WBT. Animations became pixelated, sounds were garbled or failed to load, and screens appeared slowly. We were able to rule out bandwidth considerations by creating Authorware packages of less than 50 kilobytes that still ran very slowly on a 10Mbs network. Packages with only a few lines of text and a Flash animation were actually using 95 to 100 percent of the processors' resources on each machine. Macromedia documentation and discussions on the Authorware newsgroup confirmed that the Web Player requests all available cycles from the local machine's processor and only gives back cycles if other applications request them. Running the same Flash animations outside of Authorware from the same Web server yielded perfect performance and confirmed that it was the Web Player monopolizing resources, not the Flash animations or other content.

The CSU Libraries were able to partially alleviate these problems by changing some Web packaging settings. The Authorware Web Packager allows the WBT developer to specify the size of the segments into which the Authorware piece will be split. While not all segments can be split to the desired size, Snydar recommends using larger segment sizes when delivering an Authorware WBT over an intranet if the package contains large graphics, movies, and animations. This prevents the Web Player from pausing in the middle of a piece while waiting for the next segment to arrive. It can, however, create a delay at the start of the WBT while the Web Player waits for several segments to arrive over the network.[9]

Another annoyance with Authorware WBTs is the use of nonstandard fonts. While Authorware allows some measure of text formatting and font choice, end users must have the same font installed on their system for text to appear as intended. While Authorware allows the developer to package fonts with a file, this can be a copyright violation, since font licenses often do not allow distribution. Authorware 5.2 has a way of temporarily downloading a font to the user's local machine, but this runs into some of the same security issues mentioned above when Authorware tries to write to the end user's computer. Without being able to control the fonts used in a piece, planning screen layouts is very difficult. A block of text designed to fit in the Authorware presentation window with a particular font at a specific size may run off the screen on the end user's machine. At times, the CSU Libraries have had to create text in bitmap or Flash formats to ensure that it would appear correctly. This can significantly increase the amount of bandwidth used by the piece.

Technical Support

Anyone considering learning to use Authorware should be prepared to hunt for solutions to their problems. Authorware ships with a manual, though it is far too brief to discuss all of the features present in this development platform. All too often, the reader is referred to the HTML-based Authorware help pages. Searching the HTML pages without first referring to the manual can be frustrating. On the other hand, the manual contains system variables and system functions references that provide excellent documentation of syntax and examples for use. Without these, it would be nearly impossible to use Authorware's impressive programming features.

In recent years, it has become common for publishers to market third-party manuals for those learning commercial software packages. There are only a few such books on version 5 of Authorware, one of which is *Authorware Attain 5 Authorized* (1999), from Peachpit Press and Macromedia Press. The lack of manuals created by experts independent of Macromedia is a serious drawback, since vendors often neglect to mention bugs and quirks in their products.

By registering Authorware with Macromedia, owners get ninety days of technical support, though Macromedia personnel can be slow to respond. The few times that CSU Libraries staff called Macromedia technical support, they were able to discover solutions to problems before Macromedia did. In one instance, Macromedia never found a solution. Luckily, the Authorware newsgroup makes up for shortcomings in Authorware technical support. The newsgroup has many active members who post and answer questions on basic or highly advanced topics. While Macromedia maintains and monitors the newsgroup, members speak freely about the product and often reply with solutions and sample code within minutes or hours.

Authorware's Future

The future of Authorware is a constant topic for discussion on the Authorware newsgroup. Some developers speculate that Macromedia is moving to a Web focus and will concentrate on such products as Flash, Dreamweaver, and—with the acquisition of Allaire—ColdFusion. Others say that Authorware's high price and infrequent upgrades are intended to discourage new developers from

using Authorware as a platform. There is another group of developers who think that Authorware's remarkable penetration within an admittedly small market and its high price tag ensure that someone will purchase the rights to Authorware if Macromedia decides to drop the product. Macromedia will need to create a new version of Authorware soon in order to fix a bug that prevents the program from running on machines with more than one gigabyte of combined RAM and virtual memory. As memory in high-end workstations increases, this flaw is looming ominously.

Conclusions

Authorware is a powerful tool. Unfortunately, it is based on aging code and is not native to the Web. Teachers and librarians looking for a tool for Web-based training should examine Authorware, but only in certain situations. As a tool for delivering CBTs or WBTs in a controlled environment, Authorware may have no rival. When a developer can be certain of the ability to write to a user's hard disk and knows that the end user has a high-bandwidth connection, Authorware is a tool to consider. If the developer is able to deliver content via CD-ROM, Authorware becomes an even more viable option. Either way, the developer should be ready to invest a good deal of time learning the software in order to produce a quality product. Conversely, if the final CBT or WBT does not need a great deal of multimedia integration, user interaction, and database connectivity, using Authorware may be overkill.

If an organization is considering Authorware as a platform for Web-based training of users anywhere with any type of Internet connection, they may wish to investigate other tools. Many Web courseware products such as WebCT and Blackboard are highly platform-independent and provide excellent technical support. They allow teachers to create online presentations with minimal training, though they do involve substantial monetary investment. For a WBT with minimal interactivity but a large amount of media, an HTML site with moderate amounts of Flash animations could be another option.

The CSU Libraries have been able to produce an excellent WBT with Authorware, but not without a great deal of work and troubleshooting. Because the CSU Libraries wanted to create more than static Web pages full of text that students had to read, they feel that Authorware was a good choice.

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Index to Advertisers

Book Review

Tom Zillner, Editor

Designing Web Usability

The Practice of Simplicity

by Jakob Nielsen. Indianapolis: New Riders, 2000. 419p. $45 (ISBN 1-562-05810-X).

I came to Jakob Nielsen's book, *Designing Web Usability*, with a certain amount of trepidation. I have been a sometime visitor to Nielsen's Web site on usability, http://useit.com. It is very spare and sparse in terms of visual feel. There are no graphics whatsoever, with all features that would normally require graphical elements provided through variations in font size and use of color. I half-expected that his book would include some sort of diatribe against overuse of graphics. In point of fact, when you do a quick page-through of the book you will find actual Web pages, with plenty of graphics, sprinkled on almost every other page. This provides your first hint of a book prepared with a great deal of care and attention to detail.

Designers on the Web face a virtual *tabula rosa*, the ultimate in blank slates. There is a lot of flexibility, and with that flexibility comes an almost infinite number of ways to screw up. Nielsen has probably seen and identified them all. He masterfully proceeds through page design, content design, and site design, reinforcing his suggestions for doing better with examples, both good and bad. Particularly interesting are examples where a site has gone through a number of generations of redesign with consequent improvement. Seeing this sort of evolution is much better than viewing dummy mock-ups illustrating the same points.

You may think that I have gotten sidetracked from the get-go by starting out discussing the examples and illustrations that Nielsen provides, but they are extremely important in a book of this sort. The Web is an inherently visual medium, and all of the principles of design that apply in other visual media, and more, must be brought to bear. Therefore, it is essential to provide numerous screen shots to illustrate the good, the bad, and the ugly in the Web world. Nielsen does this admirably.

Nielsen has all of the requisite credentials to discuss usability. For many years he worked for Sun Microsystems, dealing with user interface usability issues on a number of hardware and software platforms. His role was expanded to include Web usability upon the wildfire spread of Web content. He now partners with another usability guru, Donald Norman (author of *The Design of Everyday Things*, *Things That Make Us Smart*, and *The Invisible Computer*), in a private consulting firm addressing usability issues. Nielsen definitely has the chops, and he comes through with an extremely well-written and well-produced volume.

As I mentioned above, the book proceeds from page design to content design to site design. There are other ancillary sections, but the real meat and substance of the book are in these three sections. Because page design is "the most immediately visible part of Web design" Nielsen discusses it first. He writes at great length upon the subject of "screen real estate," in terms of maximizing utilization of the screen without wasting space with gratuitous or unimportant elements, and more importantly in terms of the ability to display information across a wide range of platforms, both in terms of browsers and of screen sizes and resolutions.

One of the big problems in dealing with a wide variety of possible Web configurations is that many designers simply don't deal with the problem at all. This sometimes results in pages that, for example, display well on Macintoshes (a frequent choice of Web designers) but look bizarre on Wintel computers. These problems are, in many or most cases, browser rather than computer problems. To partly overcome this problem Nielsen recommends testing on a wide variety of computers with multiple versions of browsers. He also believes that the pace of upgrades of browsers is slowing, so it is important to support back-level browsers for some time. Furthermore, because of this kind of user inertia it is also important to not introduce "bleeding-edge" technology to Web pages until a sufficient number of people are likely to have the browser-end plug-in on their machine. His recommended waiting period before introducing such features is one year.

A particularly nice illustration of the differences inherent in Web viewing is the rendering of a set of graphics using Netscape 3.01, Netscape 4.01, and Internet Explorer 3.01. As you might expect, there are subtle (and not-so-subtle) variations among the browsers, and this exacerbates the problems a designer faces in making pages usable.

After discussing problems with variations among computers, Nielsen very logically proceeds to discuss the move to separate content from rendering or presentation. If there are so many variations among the devices, browsers, and resolutions available to people, it makes sense to accommodate these variations as much as possible without changing the underlying content; thus the separation. Nielsen follows up this observation with a subsection discussing style sheets, although he notes that at the present time, the major incentive to use style sheets is not the ability to display the same content across a wide range of platforms. Because information about platform is not, by and large, provided to the server, it is impossible to render content to reflect the browser and hardware used by the viewer. This will come in the future, but for now the main motivation for style sheets is that they can force uniform and consistent design across a site. This is very important, because consistency aids the user in traversing and exploiting a site's content. As usual, Nielsen passes on a great deal of information

about style sheets and how to best use them.

Similarly, he is very clear and detailed in discussing the use of links within pages, passing from the broadest picture of link placement and description right down to abstruse but useful technical details, for example, that links to content that can be identified as, for example, http://foobar.com/info, should always carry a trailing slash: http://foobar.com/info/. This facilitates slightly more rapid retrieval. It is this exhaustive coverage, with the most important broad generalities first followed by detailed nitty-gritty, that typifies Nielsen's presentation throughout the book.

If content is king then Nielsen's section on content treats the monarch with the appropriate respect. Something that he emphasizes almost immediately is the importance of professional writing and editing by Web-savvy people. As a sometime writer and editor myself it is usually very clear which sites were put together with the assistance of professional wordsmiths versus those cobbled together by technicians or others without much in the way of written communication skills. Much of Nielsen's advice with regard to content are things that might seem obvious to an experienced writer or editor: keep text minimal and tightly edited, split or "chunk" material to screen-size bites, use plain language and pertinent titles. But for amateur designers or those who are not intimately conversant with both the Web and writing, these are truisms that need emphasis.

Most content is still heavily text-oriented, so it only makes sense to use experts in the world of text to help with content. Increasingly, there are other formats in use, including multimedia, images, animation, video, and audio, and Nielsen has sound advice for integrating all of these formats into Web content. Of course, one of his recommendations for these diverse media is to keep things lean, particularly given the narrow bandwidth of most users' links to the Internet. Video in particular is a huge bandwidth consumer, so it is particularly important to warn the user of the size and time demands of downloads, and to provide alternatives where feasible. For example, Nielsen suggests telling the same story presented by the video using a series of still images with a story line, possibly complemented by an audio clip. This allows users with high bandwidth or high patience levels to download the video, while those who want to move on quickly can get the gist of the video experience through a zippier alternative. Again, this is the kind of prescient, nuts-and-bolts, in-the-trenches advice that is invaluable.

Nielsen notes that although page design gets the most attention, site design is usually more important, because if the design of a site is unintelligible to users they will never see your well-designed pages. This is a sentiment with which I wholeheartedly agree. It is particularly important to have every page reflect its position to the whole, since users will probably burrow deep into your site rather than start at your home page. This is because such "deep linking" is encouraged by the manner in which other sites link to your own, but more importantly, it is a symptom of the fact that most users arrive at your site as a result of use of a search engine.

Even users who start at the entry point of your site need constant awareness of where a page lies within the overall structure. The key questions always to be answered are: Where am I? Where have I been? Where can I go? Although browsers should help answer the question of where I am and where I've been, Nielsen believes they are not particularly helpful. This is one area where I disagree slightly. If the titles of pages are well-chosen, it should be possible to look at a browser history and reconstruct your path through a site. On the other hand, the site itself should assist the user in navigation as much as possible, and the options for further exploration should be clearly displayed.

One of the most important indicators of current location is the name of the site. Usually a site is identified by a name or logo in the upper left hand corner, but it's surprising how often this basic information is omitted or placed somewhere else. Additionally, a miniature sitemap, which can be much more subtle than its name suggests, should be part of any page. Simply displaying a hierarchical set of titles is useful and need not be intrusive. For example, Nielsen illustrates this with an AT&T Web page with the headings "AT&T Easy-commerce Services" and "AT&T Global Alliance Marketing." The Web user is always aware of where on the Web site the current page resides. Again, these indicators are particularly important given how often users will arrive from other sites via deep linking.

Note that if someone has traversed the Web site from the home page down to the current location within its structure, the information marking current location also provides a coarse-grain history of where the user has been. As I suggested above, providing good page titles can help you to see where you've been, because it is difficult for the Web site to provide this information. One aid, of course, is the change in color of links when they have been previously visited. This will aid in either avoiding or revisiting pages depending on the value of their content.

Perhaps the most important user question is "Where can I go?" After all, once you have captured a user's attention you want her to find whatever she needs on your site and not leave for more informative virtual climes. Nielsen offers a great many examples of linking strategies, reflecting the importance of clearly letting the user know what logical choices can be made in moving to another Web page. As discussed

below, many if not most users will punt to search features if browsing doesn't work, but others will doggedly move around your site until they either find what they want or leave. So, providing reasonable, clear, and concise links to other pages is a very important task. Nielsen claims, correctly, that your site must have an underlying structure, and that structure should be clear to the site user. It is the links that are found on each page that will best abet the task of revealing site structure. If the structure makes sense to the user he will find it much easier and more intuitive to ferret out the information he needs. For example, if a library site has divisions that include databases and the catalog, and if the database section is further divided alphabetically, it makes it much easier for the user to find the link to Lexis/Nexis from some other part of the site.

One of the tendencies that Nielsen decries is the all-too-frequent presentation of information by a company or institution along divisional and reporting lines rather than in a structure that makes sense to the customer or other user. I have seen this tendency frequently in attempting to find information on hardware and software at vendor sites. Who cares if one printer is made by the office products division and another by the computer division? Not the customer. So why should the customer have to shuttle from one area of a site to another in order to compare pricing and features? It's not quite so easy to make this mistake on a library Web site, although it is easy to wonder why the library is usually an isolated site within a college or university, rather than having deep links from academic departments and other campus units. This seems to be a direct analog to the Balkanization of business sites along operating units rather than function.

Because there are many people who employ searching to find what they want, and because search is a fallback when users don't find information through browsing, it is critical to design your site to include good searching capabilities and, probably more importantly, a good user interface to the search features. Unfortunately, the importance of search within a site is far too often overlooked, which in the worst case can render your site unusable by half its potential viewers. People have very little patience with Web sites that don't directly match their needs and information-seeking strategies, so site builders must take into account the centrality of search to many users' Web behavior. Again, Nielsen is rigorous in his treatment of this aspect of Web-site design, including a discussion of how wide a chunk of your site to search (scoping); the advice that you ought never to provide the user with an opportunity to search the whole Web rather than just your site; advice against use of confusing Boolean search terms at the basic search level; how to lay out the search results page; and, how to use META tagging to describe the content of your pages. This is just the beginning of the detail and rigor with which Nielsen deals with searching on your site.

Nielsen deals with page, content, and site design in the most detail, but he also does a good job in his discussion of intranet design, accessibility, and internationalization. I found only one thing missing, and that is at least a brief treatment of usability testing and its importance. Although Nielsen makes some allusions to the importance of testing, particularly in his sections on accessibility and international use, he really doesn't provide any clues to its importance with respect to Web content. He also fails to offer any information on testing techniques. Although I would not expect any in-depth coverage of testing in a book of this sort, I was disappointed to have almost no mention of the value and practice of testing. I think this is a mistake.

Designing Web Usability is an outstanding book. It belongs on the bookshelf of any Web designer who has any interest in quality Web sites. Nielsen provides quality, cogent advice that should be of use to neophyte and experienced practitioner alike. Buy this book, recommend it for your library's collection. It is well worth the investment.

Software Reviews

Andy Boze, Editor

This month we'll take a look at a variety of graphics programs. Good-quality commercial graphics software is often expensive. One quality common to all the products reviewed below is that they are free, making them affordable no matter what your budget. There are trade-offs, however. These programs don't come with printed manuals or technical support, though they do come with online help or readme files. Fortunately, most of these graphics programs are simple enough to use that a manual won't be missed.

IrfanView 3.36

Irfan Skiljan
Postfach 6
2752 Woellersdorf
Austria, Europe
www.irfanview.com

Price: free

System requirements: Windows 95 or higher

Good things often come in small packages. IrfanView is certainly a case in point. Its main function is to view files of various graphics formats. Although it's not a full-featured graphics editor, it can manipulate your images in various ways. You can also convert images from one format to another, either individually or in a batch. And perhaps most surprisingly, IrfanView can view various types of audio and multimedia files, too, and even play audio CDs.

IrfanView is simple to install. You download a ZIP file from the author's Web site. Unzip the file into the directory of your choice and the program is ready to run. If you'd rather, you can download an installer, which does all the setup for you and makes desktop and menu shortcuts if you want it to do so.

You can use the program to view just about any kind of graphics file, from the common GIF, JPG, and BMP to multipage TIFF and Shockwave files. IrfanView also handles Paint Shop Pro, Photoshop, and more unusual types such as DjVu and Kodak Digital Camera files. A useful feature for some will be the ability to view icons embedded in EXE, DLL, and CPL files and to view cursor files, even animated ones. In addition to graphics, IrfanView can be used to view multimedia files including Real Audio, MPEG, Quick Time, and numerous sound formats.

It's often tedious in Windows to associate particular types of files with the programs you want to open them. IrfanView has an easy setup that lets you associate any of its supported file types with it. From then on, in an Explorer window you can double click any file type you selected, and the file will open in IrfanView. If you decide that you'd rather reassociate the file type with whatever program previously opened it, all you need to do is unselect the association in IrfanView. Of course, you can open any supported file from IrfanView's File Open dialog, or you can simply drag a file with your mouse onto IrfanView's window.

People who work with large numbers of graphics files will find the Thumbnails and Slideshow features handy. The thumbnail viewer is reminiscent of the two-pane Windows Explorer window. When you open the thumbnail viewer, you can navigate to any folder from the left pane, and all of the supported files in the folder will be displayed as thumbnail images in the right pane. You can select one or more thumbnails and then choose from any of several operations. The selected thumbnails can be saved as a single file or as individual thumbnail images. IrfanView can also create an HTML page of your thumbnail images. You can choose to make a contact sheet of selected thumbnails. The contact sheet is a new image consisting of the thumbnails, and it can be printed or saved as a graphics file. Finally, within the thumbnail viewer, you can choose to display images as a slide show. The slide show viewer opens and displays the full-sized images on your monitor at intervals you define.

Once you have loaded an image, IrfanView does offer some basic image editing functions. In addition to copying and pasting sections of an image, you can cut and crop selections from an image. You can also add text to an image, but the functionality is quite limited. Text placement can't be set very precisely and there's no option to center or justify text. IrfanView does have functions to rotate and flip images, to resize images, to increase or decrease color depth and to convert to gray scale, and a few others. The program includes several effects that can be applied to images. The effects include 3D Button, Blur, Emboss, Oil Paint, and Fine Rotation, among others. Most of the effects have parameters that the user can set.

IrfanView has a capture feature that some users will find useful. When Capture is activated, you can set a time or press a hot key to capture an image either of your entire desktop or the foreground window. The captured image can be immediately saved to a file or opened in IrfanView. Another handy feature lets you send any image as an attachment via e-mail directly from IrfanView without having to open your e-mail program. The Acquire function can be used to interface with your scanning software to scan an image directly into IrfanView.

Two advanced options make it easy to view images in IrfanView. You can add IrfanView to the "Send To" shell menu so that you can quickly open files in IrfanView, even if they haven't been associated with it. You can also add "Browse with IrfanView" to the shell menu for drives and folders. This will let you right click on any drive or folder, then select to open thumbnails of all the supported file types to see what's there conveniently.

It's important to note that many of IrfanView's features are incorpo-

rated through plug-ins. All of the plug-ins can be downloaded from the author's Web site. Installation is as simple as copying the plug-ins to IrfanView's plug-ins folder.

For a small program, IrfanView packs a lot of functionality. Anyone who works with graphics should take a look at it. The author offers it as freeware for private, noncommercial use, but if you like the program, he asks that you consider registering it for $10.

Satori PhotoXL 2.29

Spaceward Graphics Ltd.
Denmark House,
3b High Street,
Willingham, Cambridge,
CB4 5ES, United Kingdom
www.satoripaint.com

Price: free

System requirements: PC with Pentium or higher processor or DEC Alpha, MS Windows 95 or later or Windows NT4.0 or later, 16MB of memory for Windows 95, 32MB for Windows NT or higher (64 MB or higher recommended), 10MB hard disk space, Super VGA (800x600) or higher with true color mode. Also supported: TWAIN-compatible scanners or digital cameras, Wintab-compatible tablet, or Windows-compatible tablet.

Satori PhotoXL is a full-featured, commercial graphics editing program. Version 2.29 is offered as freeware by Spaceward Graphics since the release of a later version. If you've used PhotoShop or similar programs, you'll find Satori just as capable. In fact, the company's Web site mentions that Satori was used to create graphics for the film *The Matrix*. The program can be downloaded directly from the Web site.

The only real drawback to the freeware version of Satori is its limited support for various graphics formats. Notably lacking is the ability to read or save GIF files. Web-page designers might find this alarming until they realize that there is support for PNG (Portable Network Graphics), which is supported to varying degrees by current Web browsers. Satori does support a reasonable variety of additional graphics formats, including TIFF, JPG, Targa, Photoshop, BMP, and PhotoCD.

Those who are already used to another graphics program may need a little time to get used to Satori. Once you see how the program works, it's comparatively simple to use. The Satori desktop will be familiar to anyone who has used a graphics editor. It has several tool bars that can be docked along the edges of the main work area, or they can be undocked and left to float anywhere on your screen. The color and zoom palettes can similarly be docked or floated. If your screen space is tight, you can turn off any toolbars or palettes you don't need.

The color palette is a typical color mixing and selection tool. It contains two color wheels, a color picker, and tabs to select from its various functions. A stripe at the palette's bottom shows the current color selection. Dragging your mouse cursor over the color wheels allows you to select a color. You can select a color from an image by clicking on the color picker button, then dragging the mouse cursor over the image. The color palette tabs are Scratch, Swatch, Mix, Slider, and Values. Selecting Values lets you view the numeric values for the current color. Slider lets you mix a color by using sliders for various primary colors. Mix creates a gradient of any two colors you select; you then can pick a color from the gradient. Swatch lets you select up to forty-eight colors so that you can easily choose among them as you work on an image. The swatches can be saved and reloaded for later use. Scratch is a sort of scratch pad that lets you preview how your brush and color will look before you apply anything to your image.

The zoom palette has controls to let you zoom into and out of an image or areas of the image that you select. You can edit within a zoom view, so you can get very fine control as you apply brush strokes. As you edit in the zoom view, you can also see the changes being made in the main image view.

Satori has features that you would expect to find in a good graphics editor. It supports multiple layers, and each layer can have a mask applied to it. This allows a section of a layer to become transparent so that lower layers can be seen through it. Satori also has a multilevel undo so any edits you make can be undone in the reverse order in which you made them. Satori treats each individual edit as an object. If you've made several edits and decide that you want to undo the first one, you don't have to undo all your edits. The object viewer displays a hierarchical list of all objects that have been applied to each layer of your canvas. Within the object viewer you can select any individual object for removal or further editing. Another useful feature is Satori's ability to unremove, or restore, an object that you removed.

Satori's main control is its actions palette, a collection of buttons and tabs from which you can access nearly every feature. Down one side of the palette are various categories of actions that you can perform, such as Paint, Geometry, and Canvas. Along the bottom are buttons that can turn on or off all the other palettes.

The Paint action lets you choose the brush you want to use, its size, and how much pressure you want to apply to the brush. Satori comes with over thirty-five brush styles, and you can design your own brushes if you are so inclined.

The Geometry action lets you choose from more than a dozen geometric shapes and similar actions that can be applied to an image. Beyond squares and circles, you can choose from lines, polygons, beziers, fills, text, and magic wand. To each shape you can apply color and various properties, image maps, and filter

effects including Tint, Blur, Emboss, Lighten, Darken, Sharpen, and Drop Shadow.

The Layer action lets you perform operations on the current layer of your canvas. Some of the operations include scaling or rotating the layer or applying a warp distortion. There are several others. The Canvas action lets you crop a region of the canvas or select a new canvas size, and thus a new size for the final saved image.

Standard filters can be selected within the Geometry action. Satori comes with several dozen CanvasFX filters, which are selected most conveniently from the Filters menu. Among the CanvasFX filters are various glows, emboss, blur, frosted glass, tints, sepia, vignettes, magnify, and oil effect. Any filter can be applied to any Geometry action. It's possible to create your own filters or to add in Photoshop-compatible plugins.

Once you have completed a canvas, you'll want to save it by clicking the save button. This will save your canvas as a Satori canvas file. When you reopen a canvas file, you'll still have all of your layers and objects intact so that you can continue to work on it. If you click the Save As button, you can save your canvas into any of the various types of supported graphics file type. Once your canvas is saved as a graphics file—PNG or TIFF for example—you can reopen it in Satori or any other graphics program, but it will no longer have it's layers and objects. When you save an image you can choose the final dimensions for it, as well as color depth and various other options.

I used Satori under Windows NT 4 on a 450 MHz Pentium III computer with 128 MB of RAM. Edits to images appeared immediately. Satori saves images quickly, if they are in the normal range of dimensions most people would use. I saved a canvas as a 640x480 pixel TIFF image in a second or two. The same canvas saved as a 6144x4096 pixel TIFF image, about eighty times larger, took nearly three minutes.

The only problem I ran into while using Satori was that once while working in a zoom view, the program crashed. Oddly this made me feel even better about using Satori. When I restarted the program, it knew that it had closed improperly previously and asked if I wanted to restore the canvas I had been working on. I lost absolutely no work. After having been an occasional user of Photoshop, I found Satori different enough to be a bit of a challenge to learn how to use its more powerful features. I was able to do basic editing tasks almost immediately, though, and there are tutorials on the company's Web site to help you learn to do more complex tasks. All in all, Satori is an excellent program that will suit the needs of nearly anyone. You can upgrade from the free version 2.29 to the current version 3 for $29.95.

PrintKey 2000 v5.10

Alfred Bolliger
Lindauerstr. 37
8309 Neuerdorf
Switzerland, Europe

Price: free
System requirements: Windows 95 or higher

WinGrab 1.40

Per Skjerpe
Henrik Ibsens gt. 10C,
4021 Stavanger,
Norway
http://home.enitel.no/wingrab

Price: free
System requirements: Windows 95 or higher

If you are looking for a screen capture program, either of these is a good choice. Each has enough distinctive features that you might want to give them both a try to see which one is right for you.

Many people are unaware that in Microsoft Windows, pressing the Print Screen key on your keyboard doesn't print the screen. Instead, it just copies the screen to the clipboard. Anyone who has gotten numerous questions about why the screen didn't print will appreciate PrintKey's ability to print when the Print Screen key is pressed. Both programs actually have customizable hotkey combinations, but only PrintKey can use the Print Screen key as a hotkey. Both programs can be configured to start when Windows starts, so they just sit waiting for a hotkey to be pressed.

PrintKey and WinGrab can both be used to view images from files as well as to capture screens. PrintKey supports viewing the following image types: GIF, JPG, bitmap, icons, and Windows metafiles. It saves to all those formats except icons. WinGrab supports JPG, TIFF, PNG, and BMP.

Once you have opened a file to view or have captured a screen, both programs let you manipulate the image. PrintKey has more options, including converting to grayscale, mirroring, embossing, sharpening, adding a border, resizing, brightness, contrast, saturation, changing color depth, and several more. WinGrab's options are limited to reducing colors, grayscale, and resizing. WinGrab does a much better job reducing colors, which is important if you are working with Web pages. PrintKey is better at resizing images without loss of detail.

Both programs can save and print captured images or those opened from files. By default a captured image is opened in a viewer. PrintKey is especially handy for people who print most of their screen captures, since it can be configured to send captures directly to the printer without having to view them first. On the other hand, WinGrab has more sophisticated printing options.

Both programs are fine if you want to print your screen captures

one at a time. PrintKey lets you control the placement of an image on a page and add footer information like date and time. You can also select how large the image will be printed. WinGrab gives you finer control over placement of the image. In fact, if you have many images to print, you can control how many are printed per page in as many columns and rows as you care for. This is handy if you want to make a contact sheet. You can just drag files from a Windows Explorer window to create a list of images for WinGrab to print. WinGrab will even let you preview the page before you print it.

Both programs let you capture entire screens or just a particular window using different hotkeys. In PrintKey for example, pressing Print Screen captures the entire screen, while pressing Alt-Print Screen captures the current window. A clever feature in PrintKey lets you capture an object just by pointing at it with your mouse. Using this feature, you could, for example, capture a screen saver. Both programs let you select regions of a screen to capture. I tend to like the way this works in WinGrab, but both programs are fine. In WinGrab, you capture something first, then you can select a cropping tool within the viewer. This also lets you crop images that have been loaded from files. In PrintKey, you first select a timer delay and then click the "Get Rectangular Area" button. After the delay, the screen freezes and you can drag your mouse cursor through the area you want to capture. Using PrintKey this way gives you time to open menus or other things that ordinarily wouldn't stay on the screen so that you could capture them. WinGrab has a similar feature.

While both programs have a timed capture feature, WinGrab's is more configurable. In PrintKey you can choose the location that the captured file is saved and the delay between captures. WinGrab lets you customize the saved file name to include the username, month and day, and a few other options. WinGrab also lets you choose to capture the entire screen or just the current window. PrintKey only captures the entire screen by timer. Both programs let you select the graphics format the timed capture is saved as. PrintKey pops up a little box whenever a timed capture takes place, which can be somewhat annoying. WinGrab can be configured to play a sound, to show a message box, or to provide no notification when a timed capture takes place.

These are both useful programs. PrintKey's strength is the ability to print captured screens with the press of a key. WinGrab is more useful if you want to save captured images as files. The programs will easily coexist with each other while running at the same time.

A newer version of PrintKey, PrintKey Pro, is available for $19.95. It has many new features not included in PrintKey 2000. It can be downloaded for a thirty-day free trial from www.warecentral.com. PrintKey 2000 v5.10 can be downloaded from www.sover.net/~whoi/pricelessdesktop.html. WinGrab 1.40 is available from the author's Web site. The next version is in beta release and will include the ability to produce HTML contact sheets.

Also Worth Looking At:

GIMP, which is an acronym for GNU Image Manipulation Program, is a high quality graphics-editing program on a par with Satori or Photoshop. It has a great set of tools and a high degree of configurability. Originally developed for UNIX platforms, it's now available for Windows, OS/2, and MacOS X. The Windows version, at least, shouldn't be considered a finished product, and it might behave unpredictably. GIMP is available for free from www.gimp.org .

If you're looking for an editor that's easy to use, you might want to give Bright a try. Although it doesn't offer all the sophisticated options of other higher end programs, this paint program does have enough functionality to make it useful for many purposes. It only supports three graphics formats, GIF, JPG, and BMP, but these will be enough for anyone doing Web pages. The maker of the software, BNDsoft, no longer appears to be in business, but Bright is free and can be downloaded from Pricelessware's graphics page, www.sover.net/~whoi/pricelessgraphics.html. If you are not familiar with Pricelessware, it's an excellent Web site for good, free software. Its home page is www.sover.net/~whoi/Priceless.html.


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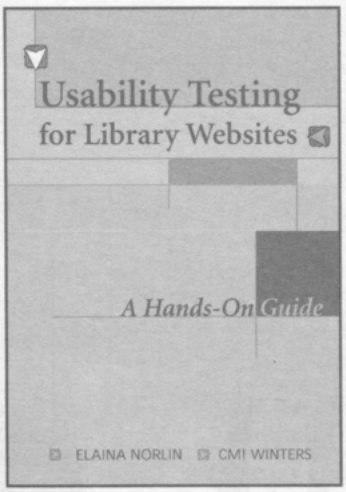

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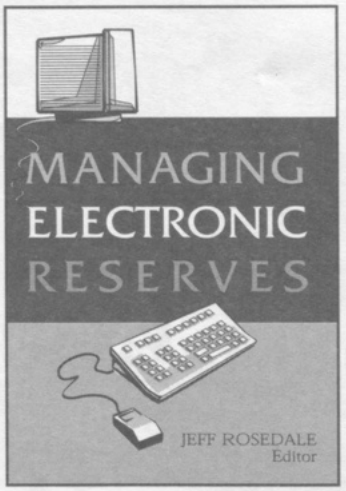

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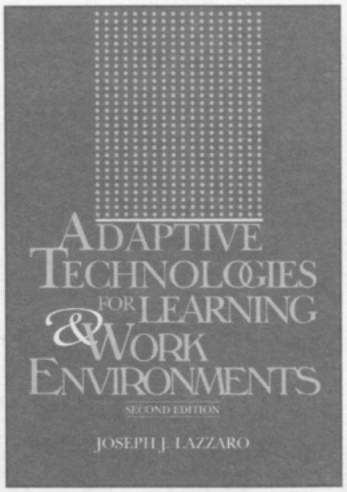

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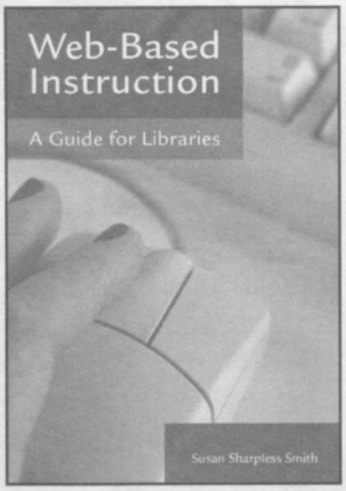

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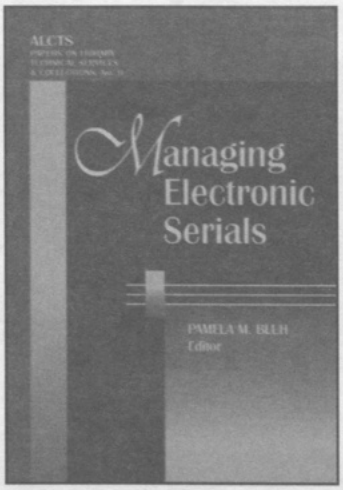

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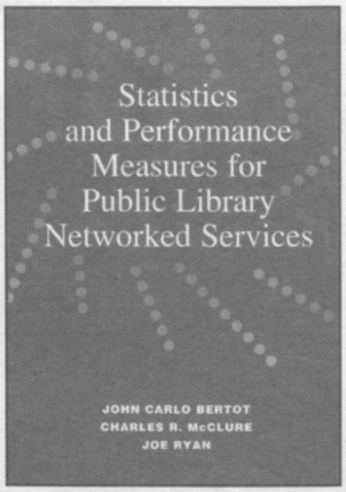

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Regional institutes now scheduling:

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Kristin Antelman, presenter

This program is intended for web managers who have basic knowledge of HTML and some familiarity with relational database concepts.

PROXY WEB SERVERS & AUTHENTICATION
Peter Murray, presenter

Special emphasis is placed on using proxy servers to access IP address-restricted resources, includes a discussion of alternatives to proxy servers that solve this particular problem.

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