

Assessing Digital Reference

RUTH A. HODGES

School of Information Studies, Florida State University, Tallahassee, FL, USA

The World Wide Web has emerged as a powerful tool to enhance navigation and communication over the Internet. Within the past few years, numerous Web-based digital reference services have been established by libraries. The goal of this study is to identify user needs as reflected in the queries they submit to these services. The study is user-centered and seeks to evaluate digital reference services from the users' perspectives. To address these issues, the paper examines digital reference questions received at a large university library in the Southeastern United States (SeU) from January to March 2001. Content analysis and descriptive sta-

tistics are used to analyze the data. Findings suggest that questions received by the digital reference service simulate questions received by traditional reference services; that digital reference service reaches only a small segment of the target population; and that the question submission form needs to be redesigned to better identify and prevent the loss of valuable user information. If the library is to succeed in delivering digital reference service and in defining the roles of reference librarians, it must enhance the quality of service to users in order to have a sustainable, competitive advantage in the provision of information in the digital realm.

Introduction

The Web has emerged as a powerful tool to enhance navigation and communication over the Internet. Within the past few years, numerous Web-based digital reference services have been established by libraries. For this study, digital reference refers to the provision of reference services via the Internet – this includes human and non-human intermediation (Missingham 2001). The key themes in this paper are the impact of technology on the provision of digital reference and the changing roles of reference librarians.

Like its precursor, traditional reference, digital reference has a service-oriented goal, where the user and the information needs of the user are the focus of attention. This is a user-centered approach, which focuses on understanding user needs, user tasks, and the context of those needs and tasks, to inform and improve the design of information systems (Dervin and Nilan 1986). The goal of this study is to identify users' needs as reflected in their queries. The study is user-centered and seeks to evaluate digital reference services, specifically, who users are, what they

seek, and what they encounter when using these services. To address this issue, this paper examines digital reference questions received at a large university library in the Southeastern United States (SeU) from January to March 2001.

Content analysis and descriptive statistics are used to analyze the data. This study is significant because digital reference service has become important for human and non-human intermediation between the users and the information on the Internet. Digital reference service, according to Wasik (1999), is an important service that supports learning and promotes intellectual inquiry. Digital reference service has national and international visibility and serves the public good by providing value-added information in a timely manner.

Assessing users' need will aid the library in identifying gaps in the service and in planning a user-centered digital reference service. This study will contribute to the undeveloped body of literature on the evaluation of digital reference and will allow for transferability of results to other settings in order to develop higher-quality digital reference services.

Ruth A. Hodges is doctoral student at the School of Information Studies, Florida State University, Tallahassee, FL. P.O. Box 21421, Tallahassee, FL 32316-1421, USA. E-mail: rah0082@garnet.acns.fsu.edu

This paper has received *honourable mention* in the 2002 Libri Best Student Award Competition.

Definitions

It will be useful to define two major terms that are used in the study: user and service quality.

User – Someone who submits a request to the digital reference service. This does not include spams, advertisements, and related marketing tactics.

Service Quality – How well a service or activity is performed (Bertot et al. 1999). Although the ultimate judge of quality is the user, quality can also be assessed from unobtrusive observation of the service.

Literature review

Emerging technologies and the growth of information have fueled a change in reference services and are changing the roles of reference librarians. This phenomenon is reviewed in the context of evolving delivery technologies and their effect on the practices and responsibilities of reference librarians in providing user needs. Considering these viewpoints, specific coverage includes traditional reference as the foundational base for digital reference, delivery technology for digital reference, and the evaluation of digital reference. The bibliographies of Sloan (2000) and Wasik (1999) should be consulted by those interested in additional readings on this topic.

Modeled after traditional reference

The basic practices and methods of digital reference are founded in traditional reference (Katz 2002). That is, at the core of reference service is the user with an information need presented in the form of a question to the librarian, which results in a question-negotiation process between the user and the librarian in order to clarify that need. Katz refers to this process as the reference interview. This practice is used in digital reference, but unlike traditional reference, where communication between the librarian and user is usually face-to-face in the physical library, in digital reference communication between the librarian and user is through the Internet using e-mail, chat, and related communication media. Discussions below will further elaborate on the various technologies used to deliver digital reference services via the Internet.

Delivery technology

Essentially, there are three kinds of communication media to deliver digital reference via the Internet (i.e., e-mail, chat or chat-based, and Web contact centers), whereas e-mail is considered the oldest. Early e-mail reference services were originally menu-driven and were used at the University of Washington Health Sciences Library and at the Health Sciences Library of the University of Maryland-Baltimore during the mid 1980s (Howard and Jankowski 1986; Weise and Borgendale 1986). Many providers of digital reference have since moved to chat-based and related communication media. These applications include instant messaging (IM), Multi-User Object Oriented (MOO) environment, and other related software applications, which are intended to provide more real-time digital reference that emulate telephone and face-to-face reference services (Breeding 2001).

Web contact centers [call centers or customer relationship management (CRM) and related applications] have mechanisms that enable the digital reference service to route questions quickly through the system and store questions and corresponding answers in a database for reuse as frequently asked questions (FAQs).

The capacity to handle large volumes of questions and answers makes the Web contact center the technology of choice for large digital reference services such as consortia (McGlamery and Coffman 2000). Moreover, the Web contact center and some chat-based applications include collaborative features such as escorting, co-browsing, whiteboard, and file transfer, that allow the user to have more interactivity with the librarian and with non-librarian resources such as an OPAC, bibliographic databases and related resources (Coffman 2001).

In sum, the various delivery technologies permit users to submit questions for reference assistance via the Internet from the convenience of their home, office, or some other location without having to come into the library. Thus, users can request information from the library irrespective of time, space, or distance.

Disadvantages of the various delivery technologies

Although e-mail, chat, and Web contact centers provide users convenient and accessible reference

services and enable librarians to telecommute and serve users through the Internet, some disadvantages of these delivery technologies are as follows (Abel 1995; Foley 2002; Gross et al. 2001; Breeding 2001):

- There may be long delays between messages (e-mail);
- Some librarians may exhibit high anxiety and feel pressured when having to rapidly answer questions, particularly in non-visual services where the user cannot see the librarian working on their requests (chat);
- Fast typing skills are required to rapidly provide extensive responses (chat);
- There are no visual or audio cues to guide the reference interview;
- Users become impatient and disconnect if librarians take too long, leaving librarians uncertain about the status of the interaction;
- Librarians often find themselves dealing with technology issues outside of their normal job description;
- The technologies capture transactions and record transactions, allowing question-answer pairs to be stored, reused, and analyzed; however, this may be an invasion of user privacy; and
- The software application may be very expensive to implement (web contact center).

Abels (1996) noted the lack of research pertaining to e-mail reference interviews, indicating that such research was needed to better inform librarians of how best to conduct an effective reference interview via the Internet. Today, this observation pertains not only to e-mail reference interviews but also to the reference interview using other delivery technologies.

Evaluation of digital reference

As indicated above, the question-answering process and the technology used are the essence of digital reference, and as with any new or ongoing service, digital reference should be evaluated to determine its success or failure. Van House et al. (1990) describe evaluation as the "comparing of 'what is' with 'what ought to be.'" McClure (1980) notes that evaluation tells us whether a project is effective with respect to the goals and objectives of the organization and whether allocated resources are efficiently used in terms of the service. What is learned from evaluation will ultimately affect the type of digital reference services pro-

vided as well as the roles played by librarians in providing such services.

The literature reports few studies actually evaluating digital reference. Lankes and Kasowitz (1998) state that the concept of digital reference is so new that not much information is available to define best practices for its evaluation.

In view of this shortcoming, Kasowitz et al. (2000) suggest that, "Digital reference can borrow from traditional reference in terms of identifying quality characteristics of reference service" as areas to assess. Wasik (1999) recommends question-negotiation, while Gray (2000) and Seiden (2000) propose analysis of questions as a general form of assessment. Kasowitz et al. propose measures of quality standards based on user transactions (components occurring during the question-answering process) and service development/management (decisions for creating and maintaining service quality and user satisfaction).

A more innovative approach to research in digital reference was proposed by Matt Saxton, at the 2001 *Virtual Reference Desk Conference* in Orlando, FL; he suggested that more research is needed on the various interactions that occur in the digital reference environment, stating that most studies have focused on the product (the answer to the query), which is undoubtedly affected by these interactions.

As stated above, studies on the evaluation of digital reference are limited and those evaluations that have been conducted generally use survey and question analysis as data collection methods. The problem with surveys, according to Gross et al. (2001), is that they generally have low return rates, small sample sizes, and lack feedback from primary users of the service. Question analysis entails classifying questions into different categories similar to content analysis, the method used in this study. As such, question analysis is further discussed below, including its advantages and disadvantages.

Question analysis

As a type of content analysis, question analysis has its origin in traditional reference. Richardson (1995) attributes the origin of classifying reference questions to Isadore Mudge and Margaret Hutchins (1937; 1944). This method entails classifying the question first by type of format (e.g.,

historical, biographical, bibliographical, etc.) then by specific source within the format as a technique for answering questions.

Richardson reports that questions have also been classified by type (e.g., directional, ready reference, instructional, etc.) as well as by subject, time-period, and language. Building on the Mudge and Hutchins framework much can be learned about digital reference services by examining the questions received as indicated below.

Several studies have employed question analysis to assess the performance of digital reference services. While this method provides a useful evaluation approach, most studies do not clearly describe how categories are derived, or only vaguely describe such methods. To have useful studies that can be replicated by others, a study needs to:

- Describe the methodology used;
- Fully describe the coding categorization used, including how it was derived; and
- Maintain clearly, distinguishable categories throughout the study.

Diamond and Pease (2001) provide a good example of a study using question analysis. The authors indicate that their classification scheme was derived from the data. Categories are clearly defined and are independent of each other. The authors analyzed 450 reference questions received at an academic library for August 1997 and May 1999 in order to assess the performance of their library's digital reference service.

According to Gross (2000), classifying questions can strengthen the performance and evaluation of reference services. Moreover, Bertot et al. (2000) state that the networked environment is complex and is rapidly changing. As a result, they recommend using multiple methods to study it.

Methodology

Design and limitations

Content analysis and descriptive statistics are used to analyze logs of data collected from Web forms of digital reference transactions at a Southeastern United States (SeU) consortia-affiliated library. The library's user population consists of

approximately 22,000 students and 4,000 faculty and staff. From January to December 2001 the SeU digital reference service received 714 questions. This study, however, covers the periods January through March 2001 during which time 187 email question logs were received. As discussed below, the 187 questions were reduced to 170 questions and analyzed for question type, user demographics, and type of services requested. Because this is a case study limited to this library, findings are not generalizable to other libraries. However, this study can be used to provide guidelines and strategies as lessons for practitioners who might want to perform a similar study in their own libraries.

Other limitations include the use of two different Web forms by requesters to submit requests. The Web assistance form was primarily designed by the major consortium agency with the assistance of other consortium libraries to answer technologically related questions pertaining to the consortium's portal. This form was used to collect a variety of demographic information. The other form, *Electronic Reference*, was designed by this library to collect reference questions.

Because both Web forms are linked to the library's OPAC, requesters sometimes use the consortium-developed form to submit reference questions instead of the library's reference form.

In addition, the library receives a number of technically related questions pertaining to the OPAC, databases, and the proxy server. These two forms tend to thwart consistency in collecting demographic information such as student rank, whether users are remote or on-site, etc.

In addition, privacy issues restrict knowledge of the identity of users; it is therefore not possible to determine whether requests are from different users or from repeat users. Moreover, sufficient numbers of responses to questions by librarians were unavailable to enable an assessment of the accuracy and timeliness of responses.

Assumptions

Because this is an unobtrusive study based on self-reported data from the user, a primary assumption is that most users truthfully indicate their status and institutional affiliation, as well as their information needs to the digital reference service.

Sample

A cross-sectional analysis was conducted during the first quarter of 2001 using logs from digital reference transactions at this SeU library. Although digital reference has been provided by the library since 1998, the year 2001 was selected for analysis because, according to Peters (2000), a sound assessment plan can emerge only after the project or program to be assessed has been in existence for some time.

The Reference Department at this library provided 187 e-mail logs containing digital reference questions from January through March 2001. For the purpose of this study, logs refer to text files containing the queries from the user's e-mail and Web form requests.

Personal information about the user was removed from logs, (e.g., name, e-mail, telephone, IP address, etc). Twenty-three questions were discarded due to:

- Duplication (13) – Two or more copies of the same question log. In such cases, only one log's question is used for analysis.
- Blank forms (five) – Forms without questions.
- Librarian response (four) – Response or answer to question(s) by a librarian.
- Advertisement (one) – A log containing promotional information.

Further analysis of the remaining 164 logs revealed that six logs comprised two questions instead of one. These six additional questions were added to 164, yielding 170 questions for content analysis. The splitting of multiple questions into separate components was necessary, since the question is the unit of analysis in this study. Questions were numbered from 1 to 170, and logs containing multiple questions were marked with an asterisk above one of the questions. Content analysis was used to characterize user demographics and question categories. SPSS was used to code and further analyze data using descriptive statistics.

Content analysis

Krippendorff (1980) describes content analysis as a method dealing with phenomena other than those directly observed. As Budd et al. (1967) sug-

gest, content analysis demonstrates quantitatively the nature of the qualitative difference in categories and data for decision-making about the service. The advantage of content analysis, according to Babbie (1998), is that it is more economical and easier to repeat than survey research.

In content analysis, the categories used for analysis are derived from the data itself, which makes it an ideal method for analyzing the changing networked environment. As an unobtrusive method, content analysis seldom affects users' behavior as do obtrusive methods such as survey, interview, and focus group. A disadvantage of content analysis, however, is that it is limited to recorded text. Moreover, some may question the ethics of observing and analyzing individuals without their knowledge or consent. As the method of choice for this study, content analysis allows for unobtrusive observation of the:

- Characteristics of the users of digital reference, (i.e., status and other demographics);
- Information sought by users of digital reference; and
- Problems encountered by users of digital reference.

Validity and reliability: The coding scheme was inductively developed from an initial analysis of approximately 10% of e-mail logs from digital reference requests (Krippendorff 1980; Weber 1990). A coding scheme was developed based on general themes or patterns in the data and was revised as new patterns emerged. The final coding scheme was consistently used to assign meaning to the data based on assumptions made in each coding category. The discussion section of this paper includes examples from the research to describe how this scheme was applied. Due to time and budgetary constraints, the coding scheme was only tested by one coder, which may raise some questions about validity and reliability. The categories and subcategories for the coding scheme are operationalized (coding rules) and discussed in the following section:

Coding categories:

- User demographics
- General subject

- System components
- Item type
- Question type
- Information Service/policy

Coding rules

Demographics include the types of requesters (status and rank) and their institutional affiliation as self-identified by the requesters. Requester *status* is labeled as *student* (includes *student rank*), *faculty*, *librarian*, and *staff*. For example, university students identify themselves as *student*, *undergraduate* (freshman, sophomore, junior, and senior) or as *graduate* (masters, specialist and doctorate). *Student rank* subcategories include *undergraduate*, *graduate*, and *rank unknown*. *Rank unknown* is used to classify students whose rank could not be determined.

Requesters identifying themselves as *faculty* include university employees with academic rank, such as professor, associate professor, assistant professor, and instructor. The category *librarian* represents library personnel with a M.L.S. or related degree. The *staff* category represents a non-faculty or non-librarian employee of the university. *Affiliation* for requesters include institutional affiliation for students, faculty, and staff of the SeU library; affiliated SeU consortia universities (SeUC); and non-SeUC requesters. *Other* represents requesters or users whose status and/or rank or institutional affiliation could not be determined.

General subject is the broadest category by which questions are classed, primarily according to the academic discipline that it represents (e.g., *biology*, *chemistry*, *English*, *education*, etc.). Merriam-Webster's Collegiate Dictionary and Britannica Online are used to define these disciplines. Other categories classed under *general subject* include *technical problems*, *instructional/BI*, and *non-reference services*. *Technical problems* include questions about access to online *databases*, *OPAC*, *proxy server*, *network connection*, or *logon*. *Instructional/BI* questions represent opportunities to instruct or assist requesters about specific databases or the OPAC. To identify the source of specific technical or instructional problems, these are subcategorized as *system component* below. *Non-reference services*

are requests for services that are usually handled by departments other than reference, (e.g., inter-library loan (ILL), circulation, collection development, etc.). *Unknown* were subcategories where the question was ambiguous or unclear as to the specific subject of the request.

System component includes the OPAC, database, proxy server (server connecting off-campus users to commercial databases), *password* (logon/password), *unknown* (specific system component not identified by the user) and represents the source of a specific technical or instructional difficulty. *Non-system components* are requests other than *technical* and *instructional* problems.

Item type questions identify the specific resource requested by the user. Subcategories include *archival*, *book*, *journal*, *map*, *microform*, *newspaper*, *software*, and other resources. *Non-bibliographic* questions do not specify *item type* and primarily represent *ready reference* or *research* questions. *Multiple item type* questions are requests for two or more sources.

Question type subcategories include *known item*, *ready reference*, and *research*. *Ready reference* is quick or factual type questions. *Known item* questions include the title and/or full bibliographic citation of the material requested.

Research questions are *question types* that are not categorized as *ready reference* or *known item* and are complex questions requiring two or more sources to answer the question.

Information policy/services questions are policy related or requests for services from other departments. This category of requests includes services such as checking-out books, purchasing new titles, library hour, ILL, photocopying, and study carrel reservation. Questions other than *information policy/services* were classed as *Non-service policy*.

Descriptive statistics

Descriptive statistics were used as a second method for analyzing the data. The occurrence of users' characteristics and search activity as depicted in each digital reference query was classified in the appropriate coding category. The total number of times that a coding category is represented in the data set, 170 questions, is represented as frequency and percentage counts using SPSS software.

Results

Status and affiliation

Students comprise the majority 129 (76%) of the 170 digital reference requesters and 99 (58%) are affiliated with SeU, 1 (1%) SeUC, 4 (2%) non-SeU, and 25 (15%) other institutions. Graduate student requesters 39 (23%) are slightly higher than undergraduate 25 (15%).

The rank could not be determined (*rank unknown*) for 65 (38%) students. Institutional affiliation could not be determined for 41 (24%) students (see figs. 1, 2).

Faculty comprises 14 (8%) of requests. Eleven (6.5%) are affiliated with SeU and 3 (1.8%) affiliations could not be determined (other). Staff comprise 4 (2.4%) of requesters. Institutional affiliation includes 1 (0.6%) SeU, and 3 (1.8%) affiliations could not be determined (other). Librarians comprise 4 (2.4%) requesters. One (0.6%) was affiliated with SeU and 3 (1.8%) affiliation could not be determined (other). Other comprises 19 (11%) requesters whose status was unknown. The affiliation of requesters includes 3 (2%) SeU, and 16 (9%) affiliations could not be determined (other) (see figs. 1, 2).

General subject

The largest number of general subject requests includes (N = 170) technical problems 39 (23%) which were followed by instructional/BI 26 (15%). Biographical questions include 12 (7%). Non-reference department questions comprise 28 (17%). One to eight (0.6% to 5%) questions comprise the remaining subject categories, respectively (see fig. 3).

A large portion of technical problems and instructional/BI questions pertains to accessing system components such as: database 39 (23%), proxy server 10 (6%), and unknown 7 (5%). Proxy server and database access were the most frequently occurring type of technical problems. At least one technical problem was related to the browser, OPAC, and password/logon.

Requesters most often required assistance searching (instructional/BI) the OPAC and databases such as FirstSearch, Lexis-Nexis, and Carl Uncover. The remaining general subjects, (i.e., anthropology, art and dance, biological/biomedical,

Fig. 1: User status and affiliation: SeU, Southeastern University; non-SeU, non-Southeastern University; SeUC, Southeastern University Consortium; N = 170.

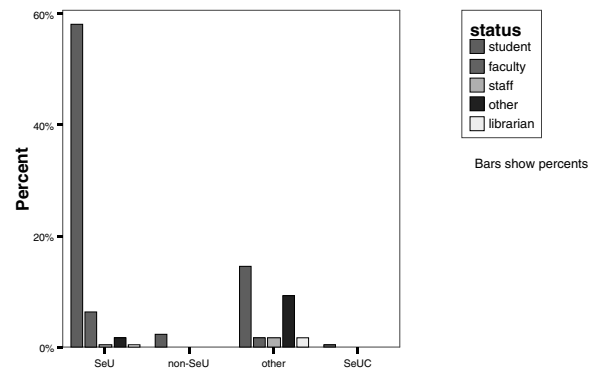


Fig. 2: Student rank and affiliation: SeU, Southeastern University; non-SeU, non-Southeastern University; SeUC, Southeastern University Consortium; N = 170.

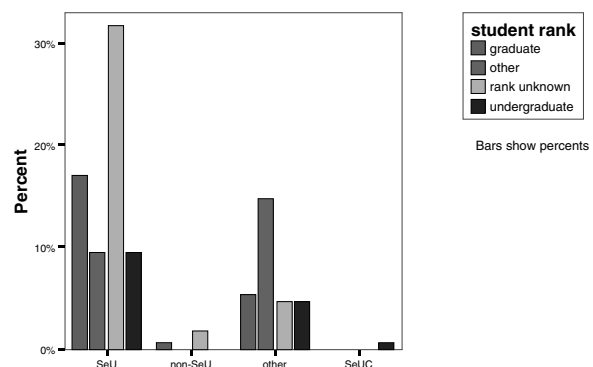


Fig. 3: General subject and user status; N = 170.

Gen. Subj	status					Total
	student	faculty	staff	other	librarian	
anthropology	1.8%					1.8%
arts & dance				0.6%		0.6%
bibliographical	1.2%			1.8%		2.9%
biographical	4.7%			1.8%	0.6%	7.1%
biological/biomedical	1.2%	1.2%		0.6%	0.6%	3.5%
business	2.4%	0.6%	1.2%		0.6%	4.7%
career	0.6%			0.6%		1.2%
communication	0.6%	0.6%				1.2%
economics		0.6%				0.6%
education	2.4%					2.4%
english	0.6%					0.6%
environmental science	1.2%					1.2%
geographical	0.6%					0.6%
historical	2.9%					2.9%
information studies	1.2%					1.2%
instructional/BI	14.1%	0.6%		0.6%		15.3%
law	.6%			1.8%		2.4%
non-reference	11.8%	2.4%		1.8%	.6%	16.5%
physical/chemical	.6%	1.2%	.6%	.6%		2.9%
psychological		.6%				.6%
public health	.6%					.6%
religion/philosophy	1.2%					1.2%
sociological	.6%					.6%
sports/physical				.6%		.6%
technical problem	22.4%	.6%				22.9%
unknown			.6%	.6%		4.1%
Total	75.9%	8.2%	2.4%	11.2%	2.4%	100.0%

law, business, etc) ranged from 1 to 8 (0.6% to 5%). Hence, no academic subcategory dominates in terms of general subject questions.

Fig. 4: Student rank and item type; N = 170.

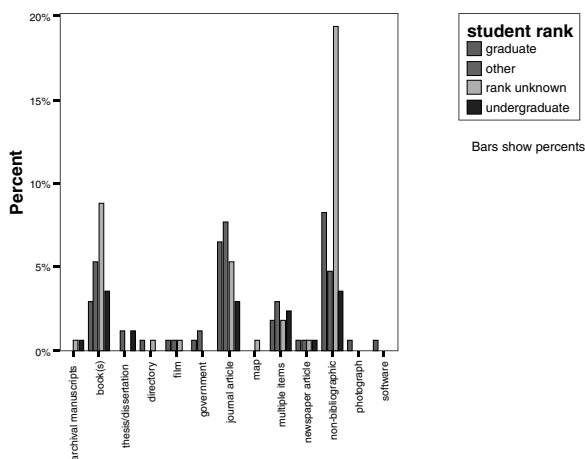
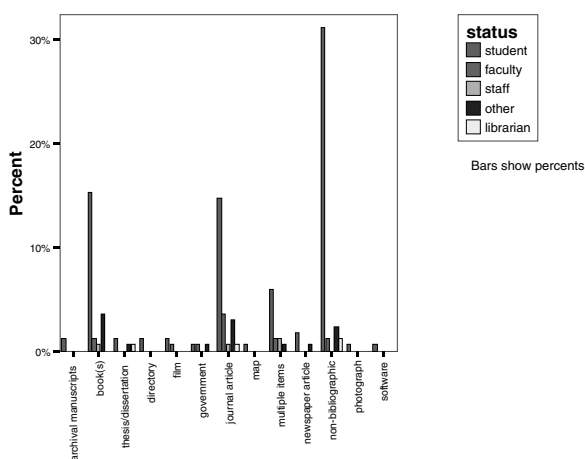


Fig. 5: User status and item type; N = 170.



Item type

Figures 4, 5 show the frequency count for types of materials or resources requested (N = 170). Journal articles 38 (22%) and books 35 (21%) were the most frequent types of materials requested. Thesis/dissertation, directory, government documents, newspaper articles, maps, related materials, and non-bibliographic resources comprise the remaining subcategory for *item type* 97 (57%).

Question type

As expected, *ready reference* 107 (63%) was the most frequently asked *question type* (N = 170) (see figs. 6, 7). At least 49 (29%) requesters provide a title or bibliographic citation (*known items*) for requested materials. The remaining 14 (8%) requests were *research* questions (see figs. 6, 7).

Fig. 6: User status and question type; N = 170.

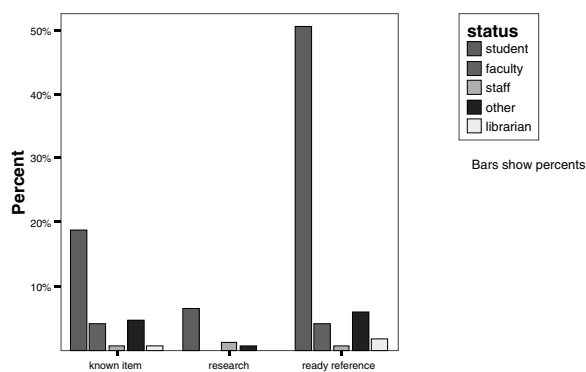
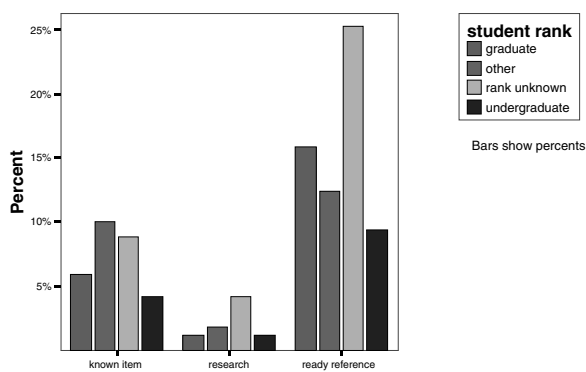


Fig. 7: Student rank and question type; N = 170.



Information services/policy

Interlibrary loan 15 (9%) dominates the number of *service policy* requests (N = 170). This type of request was followed by circulation 8 (5%), collection development 3 (2%), photocopying 3 (2%), course reserve 1 (0.6%), and study carrels 1 (0.6%). The remaining requests were non-service policy (see figs. 8, 9).

Discussion

This investigation is a needs assessment of the digital reference services of a SeU library during the spring semester of 2001. That is, what aspects of users' needs as reflected in the queries submitted can be used to evaluate digital reference services? Specifically, the evaluation attempts to determine who users are, what they seek, and what their experiences are in using these services. Answers to these questions will aid in the planning and implementation of higher quality digital reference services.

Fig. 8: User status and service/policy; N = 170.

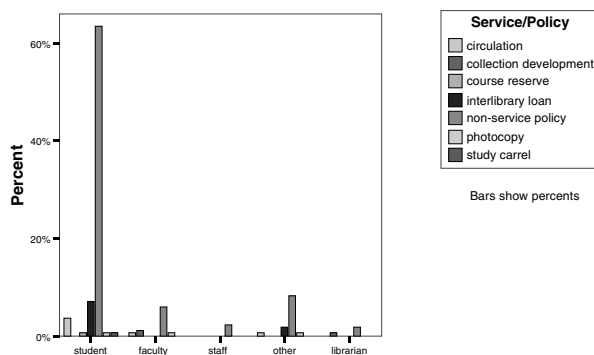
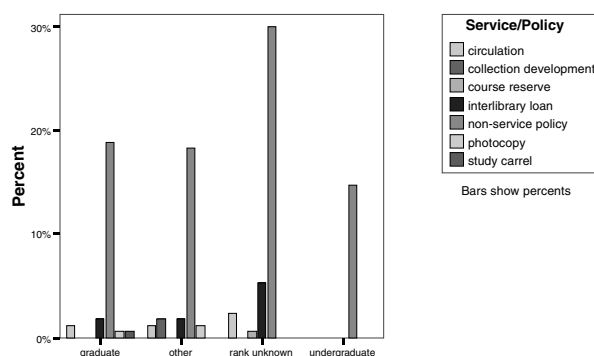


Fig. 9: Student rank and service/policy; N = 170.



Findings suggest that more sophisticated software is needed in the library to enhance the delivery of digital reference. Coffman (2001) and Francoeur (2001) discuss software that provides personalized interactions between the library-mediator and the user. Such applications facilitate the instructional and technical roles of the librarian in assisting users in cyberspace.

Data indicate that students are the primary users of digital reference at the SeU. However, the number of students found as users of digital reference represents less than 1% of the total student population of approximately 22,000. Such low usage could be attributed to failure of the library to sufficiently promote its digital reference service and/or their having the link for the service several clicks away from the library's home page. Stacy-Bates (2000) suggests that, "The fewer clicks needed to reach the [digital reference service], the larger the number of users likely to find and use it".

Atypically and limiting this study, the SeU's Website displays two different Web submission forms that did not consistently collect the same

data for digital reference. For example, one submission form did not collect *student rank* information; so, students submitting requests on this form could not indicate their rank and had to be classed as *rank unknown*. This is the highest category for the student rank count, probably because this submission form is more closely linked to the SeU library's home page than the other form.

Because the submission form does not require students to list their rank, this researcher's ability to accurately determine which student group is the primary and repeat users of digital reference services is limited. Having a web form collect information that identifies repeat users within the primary user group is important because, according to Kingma (2001), recurrent users represent a demand for goods and services and a measure of consumer benefit. If the service is consistent and reliable, according to Berry (1989), higher current-customer retention rates and more business from current customers result. The assumption is that repeat users may represent a form of customer satisfaction, especially when the same service is provided by other institutions, which is suggested by McClure et al. (2002) in their new measures for assessing quality in digital reference.

What do users seek? The data show that ready reference, instructional, technological, and non-reference assistance were the most frequent types of information requested by users. Ready reference and non-service requests are further discussed below. Users primarily experienced difficulty searching or accessing specific bibliographic databases, and the OPAC. Other users required instructional assistance. As seen, there are not only benefits but also barriers to digital reference. The best way to illustrate problems encountered is the use of quotes to supplement the content analysis:

I've tried to sign on to Lexis-Nexis but I'm unsure of my id# and password? Can you help me?

Proxy server does not recognize my password or User ID. Maybe I am using the wrong information but I have tried ever [sic] combination that I can think of.

I would like to search for the history of the Organizational Theory, but only in an academic journal. How would I search for this on [name of OPAC].

How do I go about looking online to see what books you have? Thank you for your time.

Goetsch (2001) reports that there is growing interest in exploring the benefits of and barriers to delivering reference services electronically.

Some requesters provide the title or complete bibliographic citation of materials requested (*item type*). *Item type* information can be linked to cost and used to determine the cost of a digital reference transaction. For example, the cost of a cited book in the request could be determined and used with other input information such as equipment, average librarian response time, and the average librarian hourly rate in order to estimate the cost of a digital reference transaction. Due to the variability in unit of analysis for cost studies, Abels (1997) states that calculating the costs of specific types of reference requests helps reduce variability problems. She also suggests that cost studies using categorization will require the commitment of staff to conduct the detailed data gathering required.

Question type was primarily *ready reference* and *known item* requests. The high number of *ready reference* questions indicates that users comply with the library's digital reference policy, which explicitly asks users to submit requests for brief, factual information.

The *known item* count may support Feldman's (2000) assertion that end users know why they are searching, even if they do not articulate their information needs. *Known item* requests include the call number, name of an individual, or titles of the works for which users seek. The following quotes from the data are examples of users expressing specific information needs in the category of *known items*:

Can you tell me the title of [name of person]'s dissertation? She recently finished her degree at [SeU]. Thanks

Please recall these books: Derek Walcott and West Indian Drama by Bruce King PN 2440 T7 K56 1995. Derek Walcott by Robert Hamner PR 9272.9 W3 Z69.

Is it possible to get some assistance in obtaining from the following reference source a copy of my IRIS [sic] FAMILY CREST and IRISH FAMILY COAT OF ARMS?NAME [last name] (*NO "E" ON END OF NAME). REFERENCE IRISH FAMILIES THEIR NAMES ARMS AND ORIGINS, MacLysaght, Edward, 1957, CS498.M3 OR SEE "IRISH FAMILIES" by same author [sic].

These examples suggest that users classified as *known item* searchers do indeed know what they want and are able to clearly communicate it to the digital reference service.

Some users submitting bibliographic information want specific services, such as ILL, circulation, and related services. Upon receiving such requests, reference staff at the SeU manually

route them to the appropriate department, instead of having the requests automatically routed through the systems to the appropriate destination, as done by some of the consortium-type of digital reference services (Kresh 2001). The quotes below from the content analysis of the data are an example of questions requested of the digital reference service that would typically be performed by other departments in large libraries:

Could you please send a message to me concerning an interlibrary loan from [institution's name]? It was an article by Koenig, HR et al at [university's name] concerning Blood Pressure and religious activities of elderly. Please tell me how to pick up a request? Thanks.

I am a Spanish lecturer in physical geography [institution's name] and I would like to know if it is possible to get some of the publication (photocopy ...) I have found on your Web. Thanks.

Where do I obtain forms to request a study carrel? Am doctoral student in [Department's name]. Thank you.

Is there a form on line where I can request a book be reserved, since it is currently checked out (by someone else) and I would like to get it upon its [sic]?

Using software containing collaborative features would allow digital reference to better personalize the service. The library may also be able to maintain frequently asked questions pertaining to library policy, technical problems, and searching. Some technologies automatically collect data from digital reference transactions, thereby providing available data to assess aspects of quality in the service.

Lessons learned from this study

The following information summarizes what the researcher has learned while conducting this type of investigation. By doing so, it is hoped that this information will help to strengthen the studies of other researchers using content analysis to evaluate digital reference.

- *Initial Assessment.* Unobtrusive observations, such as content analysis, can serve as an initial phase in an assessment. Supplementing the study with focus groups, interviews, or a survey would provide direct user feedback about the service. The library will be able to compare results of each method against each other, thereby enhancing validity and reliability in the reporting of the data.
- *Standard Definitions.* Content analysis includes procedures that can be replicated by others. This allows libraries to develop standard, comparative definitions

derived from the data that can be used to assess reference services in the digital environment.

- *Number and Kinds of Questions.* If the library is only interested in characterizing the number and kinds of questions received and obtaining demographic information, transaction log analysis is faster and perhaps an easier method to collect such data. The use of log analyzer software, such as Webtrend, will allow data collected by the server to be organized and graphically displayed for analysis.
- *Accuracy of the Answer.* An analysis of the answers to questions will allow the library to determine how successful it is in providing accurate information via digital reference. It will allow the library to make management decisions about staffing requirements such as training or scheduling, and whether additional informational resources are needed to enhance the quality of service.

Conclusion

This study presents one type of unobtrusive observation that merely skims the surface of user needs as reflected in the queries submitted to a digital reference service (i.e., who users are, what they seek, and their experiences when encountering digital reference services). This research analyzes questions that represent only a small portion of the primary user population, and it examines questions without their corresponding answers. Thus, findings may be viewed with skepticism and can be summarized as follows:

- Questions received by digital reference simulate those received by traditional reference services (i.e., ready reference, service/policy, information literacy, technological problems, etc.);
- Although the service reaches members of the target population, if the library plans to become a viable player in the provision of digital reference, it needs to better market its digital reference service in order to reach a larger portion of the target population;
- The library can more efficiently save search time for users and staff by using a FAQ database to manage repetitive questions received through digital reference; The digital reference submission form needs to be redesigned for better identification and to prevent the loss of valuable user information; and
- The use of more sophisticated software containing collaborative features such as co-browsing, whiteboard, and related features would better facilitate instructions or demonstrations for librarians and users during digital reference.

Considering the above service needs identified to enhance the digital reference service, implications for research are as follows:

What are the levels of interaction of users during their digital reference encounter?

To what extent is instruction occurring in digital reference?

How can questions received through digital reference be best used in the development of metadata for non-intermediated digital reference?

How does the library's target population perceive quality in digital reference?

How accurate are the answers to questions provided to users by the digital reference service?

What proportion of the target population for digital reference is comprised of undergraduate and graduate students?

How do remote and on-site users differ with respect to the experiences encountered when accessing digital reference?

A better understanding of the above factors will contribute to a more complete understanding of the digital reference process and help to determine the focus of future research in this area. Content analysis can be used as a method to identify users' needs and gaps in service. If investigations are conducted along this line, a larger sample size is recommended to assess more fully the performance of digital reference service, identify best practices, develop standards for metadata, and to obtain data that is generalizable to larger populations. Because content analysis involves the analysis of data received from users, the future of studies such as this are impacted by how the matter of privacy is dealt with (Gray 2000). Moreover, if the library is to succeed in delivering digital reference and in defining the roles of reference librarians, it must enhance the quality of service to users in order to have a sustainable, competitive advantage in the provision of information in the digital realm.

Acknowledgement

I would like to thank Dr. Charles McClure, Dr. Gary Burnett, Dr. Jane Robbins, and Dr. Melissa Gross for their assistance on this project.

References

- Abels, E. G. 1995. The e-mail reference interview. *RQ* 35:345-357.
- Abels, E. G. 1997. Improving reference service cost studies. *Library & Information Science Research* 19: 135-152.
- Babbie, E. 1998. *The Practice of Social Research*. New York: Wadsworth Publishing.
- Berry, L. L. 1989. How to sell new services. *American Demographics* 11: 42-43.

- Bertot, J. C. and C. R. McClure. 2000. *Statistics and Performance Measures for Public Library Networked Services*. Chicago: ALA.
- Bertot, J. C., C. R. McClure and J. Ryan. 1999. *Developing statistics and performance measures for the networked environment: Interim report*. URL: <http://www.albany.edu/~imlsstat> [viewed March 22, 2001].
- Breeding, M. 2001. Providing virtual reference: Libraries are finding ways to expand services to remote users. *Information Today* 18: 42–43.
- Budd, R. W., R. K. Thorp, and L. Donohes. 1967. *Content Analysis of Communications*. New York: MacMillan Co.
- Coffman, S. 2001. We'll take it from here: Further development we'd like to see in virtual. *Information Technology and Libraries* 20:149–153.
- Dervin, B. and M. Nilan. 1986. Information needs and use. *Annual Review of Information Science and Technology (ARIST)* 21: 3–33.
- Diamond W. and B. Pease. 2001. Digital reference: A case study of question types in an academic library. *Reference Services Review* 29: 210–218.
- Feldman, S. 2000. The answer machine. *Searcher* 8. URL: <http://www.infotoday.com/searcher/jan00/feldman.htm> [viewed May 24, 2001].
- Foley, M. 2002. Instant messaging reference in an academic library: A case study. *College & Research Libraries* 63: 36–45.
- Francoeur, S. 2001. An analytical survey of chat reference services. *Reference Services Review* 29:189–203.
- Goetsch, L. 1999. Electronic reference service: Executive summary. *SPEC Kit* 251. URL: <http://www.arl.org/spec/251sum.html> [viewed May 24, 2001].
- Gray, S. M. 2000. Virtual reference services: Directions and agendas. *Reference & User Services Quarterly* 39: 365–375.
- Gross, M. 2000. The impose query and information services for children. *Joy*: 10–17.
- Gross, M., C. R. McClure, R. Hodges, A. Graham, and R. D. Lankes. 2001. *Assessing quality in digital reference services: Phase II: Site visit summary report*. URL: <http://quartz.syr.edu/quality/default.htm> [viewed November 26, 2001].
- Howard, E. H. and T. A. Jankowski. 1986. Reference services via electronic mail. *Bulletin of the Medical Library Association* 74: 41–44.
- Kasowitz, A., B. Bennett and R. D. Lankes. 2000. Quality standards for digital reference consortia. *Reference & User Services Quarterly* 39: 355–63.
- Katz, W. A. 2002. *Introduction to Reference Work*, Vol. I. New York: McGraw-Hill.
- Kingma, B.R. 2001. Benefits. In *The economics of information: A guide to economic and cost-benefit analysis for information professionals*. Englewood, Colorado: Libraries Unlimited, Inc.
- Kresh, D. N. 2001. From Sshh to search engine reference.net on the web. *Information Technology and Libraries*. 20: 139-142
- Krippendorff, K. 1980. *Content Analysis: An Introduction to Its Methodology*. London: Sage.
- Lankes, R. D. and A. Kasowitz. 1998. *The AskA Starter Kit: How to Build and Maintain Digital Reference Services*. Syracuse, New York: Syracuse University. (ERIC Document Reproduction Service No. ED 427 779).
- McClure, C. R. 1980. A planning primer for online reference service in a public library. *Online* 4: 57–65.
- McClure, C. R., R. D. Lankes, M. Gross, and B. Choltco-Devlin. 2002. *Statistics, measures, and quality standards for assessing digital reference library services. Guidelines and procedures. Field test draft, March 8, 2002: The Study Assessing Quality in Digital Reference*. Syracuse University, Syracuse, New York and Florida State University, Tallahassee, Florida.
- Missingham, R. 2000. *Virtual services for virtual readers: reference reborn in the e-Library*. URL: <http://www.alia.org.au/conferences/alia2000/proceedings/roxanne.missingham.html> [viewed October 18, 2001].
- Peters, T. A. 2000. Current opportunities for the effective meta-assessment of online reference services. *Library Trend* 49: 334–349.
- Richardson, Jr., J. V. 1995. *Knowledge-Based Systems for General Reference Work: Applications, Problems, and Progress*. New York: Academic Press.
- Seiden, P. 2000. Where have all the patrons gone? *Reference & User Services Quarterly* 39: 221–222.
- Sloan, B. 2000. *Digital reference services: A bibliography*. URL: <http://www.lis.uiuc.edu/~b-sloan/digiref.html> [viewed May 15, 2001].
- Stacy-Bates, K. K. 2000. Ready-reference resources and e-mail reference on academic ARL Web sites. *Reference & User Services Quarterly* 40: 61–73.
- Van House, N. A., B. T. Weil, and C. R. McClure. 1990. *Measuring academic library performance: A practical approach*. Chicago: ALA, 3–4.
- Wasik, J. M. 1999. Digital reference resources. URL: http://www.vrd.org/pubinfo/proceedings99_bib.html [viewed March 31, 2001].
- Wasik, J. M. 1999. Building and maintaining digital reference services. *ERIC Digest*. URL: http://www.ed.gov/databases/ERIC_Digests/ed427794.html [viewed March 31, 2001].
- Weber, R. P. 1990. *Basic Content Analysis*. London: Sage.
- Weise, F. O. and M. Borgendale. 1986. EARS: Electronic access to reference service. *Bulletin of the Medical Library Association* 74: 300–304.

Editorial history:

Paper received 31 May 2002;

Accepted 23 July 2002.