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The Impact of Collaborative Tools on Digital Reference Users: An Exploratory Study

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THE IMPACT OF COLLABORATIVE TOOLS ON DIGITAL REFERENCE USERS: AN EXPLORATORY STUDY

By

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This
dissertation
is dedicated to the
memory of my mother Mary L. Hodges.

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ABSTRACT

Digital reference is a library question and answering service available via the Internet. Digital reference services provide information seekers access to a variety of resources and services to better facilitate information seekers in meeting their needs. In many services librarians interact with users synchronously using chat communication technologies, which incorporate co-browsing/escorting, and Web page pushing features. These collaborative features enable participants to see each other's desktops and engage in more personalized and interactive information seeking activities. User-librarian interactions are captured by computer server logs, stored, and retrieved as digital transcripts.

Currently, there is little research on how information seekers benefit from collaborative digital reference encounters. To fill this gap, this dissertation aims to better understand information seekers participating in collaborative digital reference activities such as co-browsing/escorting and Web page pushing as reflected in the transcripts.

This is a case study designed to explore and understand information seekers interacting in a digital reference environment. The research assesses transactional and narrative data involving digital reference users affiliated with a large university library in the United States. The study was conducted in four phases. Phase I consisted of document analysis, including a review of the host library's Web site and related documents pertaining to the chat digital reference service. Phase II consisted of chat transcript collection, isolation, and preparation of the study sample. Phase III consisted of pilot testing and final analysis of chat digital reference transcripts. Phase IV of the study consisted of standardized opened-ended interviews of users who participated in co-browsing/escorting related activities during their chat digital reference encounter.

This study is significant because transcripts can be reused to unobtrusively assess digital reference transactions in order to gain knowledge about users and their service needs. It is possible that transactional and narrative data might be used to derive a cognitive model of digital reference users. Knowledge gained can be used to better inform the digital reference service providers, which may enable them to design a more user-oriented digital reference service.

INTRODUCTION

This dissertation research was conducted at a moment in time during the evolution of digital reference services and its technologies. As a result, many of the technologies represented in the dissertation may have changed.

Digital reference services are human-intermediated question and answering services put at the disposal of persons seeking information via the Internet. Typically, these services have followed the traditional reference model, specifically with respect to negotiation of user questions (the reference interview), staffing, and evaluation. These services have also evolved from e-mail to chat to e-commerce models of communication and delivery.

As in traditional reference services, the question-negotiation process presents challenges to the digital reference librarian (Abel 1996). This process involves communications between users and librarians, wherein librarians try to help users clearly articulate their information needs. In addition to problems inherent in the traditional reference interview, the digital reference interview is further complicated by the delivery technology, which sometimes causes services to have slow response times, lack visual and audio cues, and to disconnect users. In trying to compensate for the lack of cues, some libraries have unsuccessfully experimented with videoconferencing (Folger 1997). Currently, some libraries using delivery technologies such as QuestionPoint are experimenting with Voice over Internet (VoIP). Nevertheless, only a few studies have assessed the reference interview during digital reference encounters (Nilsen 2004; Abel 1996).

As previously suggested, Internet technologies are a driving force behind delivering digital reference services, and unlike face-to-face reference, without such technologies digital reference would not exist. The Web contact center is one such technology impacting digital reference, especially in promoting various types of collaborations.[1] For example, libraries at various levels and of various service types are cooperating in global networks to provide remote users access to human-intermediated Internet reference anytime, anywhere (Kresh 2001). These

[1] The Web contact center is modeled after an e-commerce technology called customer relationship management (CRM), which also incorporates the call center and various other tools to enhance personalization, customerization, and interactivity. Further discussions on the Web contact center is found in the literature review of this dissertation.

consortium digital reference services allow users in different time zones to have global access at their own convenience to a wide range of library collections. Like other digital reference services, many consortium reference services are still in early stages of development.

The Web contact center model also allows various other collaborative activities such as co-browsing/escorting, and Web page pushing to occur during the digital reference encounter. Co-browsing enables the user to see what the librarian is viewing on the Web page and vice versa. In addition to the co-browsing feature, some collaborative tools include an escort feature that enables users to automatically follow librarians as they navigate to various places on the Web site. Web page pushing involves sending pages to users' or librarians' browsers for display on their desktops.

Sometimes difficulties may occur when librarians try to co-browse/escort users in proprietary databases (Coffman 2003). In turn, such barriers may impact users' successes or failures during their digital reference encounters. Moreover, it would be interesting to know how users handle difficulties during such collaborative digital reference encounters. That is, do users recover from specific technical problems related to URL pushing and navigation; librarian behaviors; and related barriers that delay or prevent their goal seeking activity during collaborative digital reference encounters? Nevertheless, some librarians consider co-browsing/escorting and Web pages pushing to be useful to librarians teaching search techniques to users (Ronan 2003a). Considering the implications of such collaborative activities, there is a large gap in the literature as to the extent to which they benefit digital reference users.

Traditionally, performance in library services has been assessed using a statistics-based systems approach, which assesses the amount of resources used and the products produced from their usage (Dervin and Nilan 1986). Such performance has generally been discussed in terms of input/output measures, for example the number of questions received at the reference desk, and the number of questions answered, respectively. Thus, the traditional system perspective has generally assessed user needs in terms of user demands on the system rather than in terms of understanding users' perceptions of their needs. In current digital reference services, the traditional systems approach persists. The literature is deficient as to systematic evaluations of digital reference services from the user perspective.

Problem Statement

Digital reference literature is lacking in evaluations from the users' perspective. Much of digital reference literature is comprised of anecdotal reports in the nature of how I do it in my library. Moreover, many evaluations of digital reference services have been from the traditional systems perspective (i.e., surveys of librarians' perception of user and service needs). A few studies conducting question analysis of e-mail reference services have provided vague indications of user needs. Generally, such studies are not supplemented by direct contact with the user and provide nothing more than a glimpse into the thinking, attitudinal, and situational context of users. It is important to understand user needs in order to improve information systems (both human-intermediated and non-human intermediated). Additionally, the information need is what triggers users to seek information from information systems such as digital reference services (Wilson 1981).

The Web contact center model of digital reference also allows more personalization and interactivity between the user and librarian via co-browsing/escorting and Web page pushing activities. An assumption is that such collaborative activities generally extend from the reference interview, also a collaborative process in which the librarian determines whether the user needs a document, data, guidance, instruction/demonstration, or something else to meet some goal. The literature is also inadequate in covering the benefit of these collaborative interactions for digital reference services. Moreover, only a few studies have used cognitive models to assess the digital reference user perspective (Smyth 2003; Miwa 2000). Therefore, this study proposes to close this gap in the literature by assessing users' experiences during information seeking from a chat digital reference service incorporating co-browsing/escorting and Web page pushing activities. This problem lies within the *behavior* dimension of the major research questions established at the *Digital Reference Research Agenda* symposium at Harvard University in August 2002 (Lankes 2004; Lankes, Nicholson, and Goodrum 2003).[2]

The library user seeking information over the Internet is the focus of this study. In that users are real persons, working in an information seeking environment in virtual space that connects to other real persons, who all work on real computers connected to real networks, it is

[2] The central research question for this agenda is *how can human expertise be effectively and efficiently incorporated into information systems to answer user questions.* Four broad domains in which this question can be studied include policy, systems, evaluation, and behavior.

only appropriate to consider the environment within which such users work as real, thus making this a naturalistic inquiry. As a naturalistic inquiry, the study is design to explore and understand the phenomenon through the eyes of those who experience it, the users. Thus, the purpose of this study is to better understand digital reference users participating in collaborative activities such as co-browsing/escorting and Web page pushing. Specific goals of the study are to determine:

- whether Web page pushing and co-browsing activities are triggered from a direct request from the user or from the librarian's identification of the user need for such activities;
- users' thinking, feelings, and actions regarding their collaborative activities;
- difficulties users encounter during their co-browsing and/orWeb page pushing activities; and
- the benefit of collaborative activities to digital reference users.

To address this problem, the research will assess transactional and narrative data from digital reference users affiliated with a university library in the western United States. The transactional data will provide insight into each of the above goals, while an interview of digital reference users will provide more in-depth knowledge as to the benefit of collaborative activities to them. This study is conducted in four phases: Phase I - document analysis; Phase II - sample isolation and preparation; Phase III - content analysis (pilot testing and final analysis); and Phase IV - interviews with digital reference users. Chat digital reference services are chosen because chat transcripts are richer forms of data than e-mail transcripts. Chat transcripts capture interactions of information seekers during their real-time encounters in the digital environment. Furthermore, chat-based communication media are emerging as the dominant mode of communication by many digital reference services.

Significance and Importance of the Study

Digital reference service is important because it supports learning and intellectual inquiry (Wasik 1999). For example, some Web-based services include collaborative tools such as co-browsing/escorting, Web page pushing, the Whiteboard, and other application sharing tools (Breeding 2001; Coffman 2001) that support educational activities. Hence, such collaborative activities have implications for information literacy in digital reference, specifically in developing self-sufficient users and life-long learners. In this respect, the study considers the users' perspective concerning various collaborative activities, and the study contributes toward

filling a void in the literature on research concerning digital reference services incorporating collaborative tools.

Another significance of this study is that many information seekers using digital reference services do so through consortium services. Such consortium digital reference services allow libraries to serve the public good through the provision of value-added information globally (Wasik 1999). Many consortium services use Web contact center technology to collaborate among member libraries and to handle large volumes of user questions. Through the consortium, users have access to digital reference services anytime, anywhere through their collaborative network of participating libraries of various types (e.g., public libraries, academic libraries, special libraries) (Kresh 2001). Thus, users have access to digital reference through consortium services at the local, national, and international levels. Moreover, a number of these consortium services include collaborative activities such as Web page pushing and co-browsing/escorting to support the information seeking encounter. A better understanding of the impact of such collaborative tools on users might also help improve the delivery of consortium digital reference services to them.

This study is important because unlike traditional reference services, digital reference services allow transactions to be automatically captured and stored; allow question-answer pairs to be reused; and allow data from these transactions to be available to assess user needs, librarian's training needs, and other service needs (Foley 2002; Breeding 2001; Gray 2000). In addition, these transcripts enable researchers to unobtrusively view users' communication with librarians and other aspects of the digital reference session, including barriers to these. Thus, it might be possible to gain an understanding of digital reference users from their dialogue, actions, and feelings as reflected in the chat digital reference transcripts. Observations of such users' experiences, according to a number of researchers, provide insight into users' beliefs and understanding when they contact services such as digital reference (Ingwersen 1992, 1996; Marchionini 1995; Kuhlthau 1991; White 1983; DeMey 1977). As suggested by these researchers, such insights might also provide knowledge concerning the expectations, successes, and failures of users interacting with digital reference services. Thus, it is possible that such knowledge about users will allow the development of more user-oriented digital reference services.

This study is important because various user outcomes may emerge that might be used in future studies to assess whether digital reference services have attained their user-oriented goals. Bertot and McClure (2003) refer to these as emergent outcomes, and they are not accounted for in the initial planning of such outcomes-based evaluations. Thus, emergent outcomes might also be used in future outcomes assessment studies of digital reference services. Such studies could contribute to the underdeveloped body of literature on the evaluation of the digital reference user needs and could contribute to the development of theory on evaluation.

Moreover, this study allows for the transferability of results to other similar settings. Knowledge gained can be used to improve design and develop more user-oriented digital reference services and can be used to enhance the sustainability of digital reference services.

Research Questions

General Research Question*:*

What are users' experiences with digital reference services incorporating collaborative tools such as co-browsing/escorting and Web page pushing?

Sub-questions are as follows:

- What are the benefits of collaborative activities for digital reference users?
- What difficulties do users encounter during collaborative digital reference encounters?

Definitions

Co-browsing/escorting is an application-sharing feature found in Web contact centers such as QuestionPoint, Tutor.Com, Convey and the like. Co-browsing is sometimes referred to as *collaborative browsing*, *follow-me,* or *escorting*, and it typically involves remote features that allow librarians to take control of users' browsers, thus allowing them to escort users around the Web. Everywhere the librarian goes the user goes, thus allowing the user to see the librarian's desktop. In some technologies co-browsing is a two-way feature, whereby librarians allow users to lead co-browsing activities while librarians follow (Coffman 2003). Coffman provides good discussions on three types of co-browsing (URL pushing co-browsing, proxy server co-browsing, and application sharing).

Web page pushing, also a form of co-browsing, allows librarians to send live Web pages to the user's desktop (with active links) as opposed to screen shots (with dead links), which are copies of windows from the librarian's desktop. Web pages open up in users' browsers with new pages replacing old ones (Coffman 2003).

Collaborative digital reference encounter refers to collaborative activities between the user and librarian that extend beyond the reference interview. Such activities include co-browsing, escorting, and Web page pushing activities between the user and librarian during digital reference, enabling the user and librarian to jointly view resources such as the online public access catalog (OPAC), online databases, and related resources. Collaborative activities may include computer-mediated instruction and/or demonstrations between the user and librarian. These digital reference encounters may be positive or negative for the user.

A positive user experience allows the user to achieve his or her information seeking goal without any inhibitory factors and may result in a satisfactory user's experience. A negative user experiences may be of two types:

1. Users are delayed for an extended period of time from meeting their information seeking goal. Such users may eventually recover from such delays and succeed in meeting their information seeking goal; however, the prior difficulties and/or delays may result in an unsatisfactory digital reference experience; and
2. Users are prevented altogether from solving their information seeking goals, thus resulting in an unsatisfactory user experience.

User refers to the individual who submits a request for assistance to the digital reference service. A user is sometimes referred to as an information seeker. These requests from users do not include spams, advertisements, and related marketing tactics. It is assumed that users submitting such requests are in the process of information seeking.

Information seeking refers to a process in which individuals consciously search for or ask about content that may be relevant to their needs and in which relevance is dynamic and not static (Budd 2001).

Human-intermediation refers to "the reference librarian as an intermediary or link between the user and the information system" (Bunge 1984, 14).

Session length represents the total time of user contact with the digital reference service. This includes the time question is initially submitted to the service and the time the first participant, typically the user, disconnects from the service.

User-centered focuses on understanding user needs and user tasks, and the context of those needs and tasks to inform and improve the design of information systems (Dervin and Nilan 1986).

CHAPTER 1

CONCEPTUAL FRAMEWORK

At the core of reference service is the user and the user's problem. Research focused on the user is a user-centered approach. Such research is rooted in the discipline of cognitive psychology, implying that having a user perspective means to understand users' knowledge about the world around themselves (e.g., users' thoughts, understanding, perception). This represents the user's cognitive model about his or her life-world, including the experiences of digital reference users with collaborative tools. To better understand cognitive models, it is useful to have an understanding of models in general, that is:

- What are models in general?
- What are their functions?
- How are they used?
- What are their strengths and weaknesses?

To better understand models it is also important to distinguish between models and theories.

What Are Models?

Models are perceived in many different ways, sometimes causing ambiguities in understanding them. For example, models are defined as simplified representations of reality (Lave and March 1993), instruments or tools of research (Morrison and Morgan 1999), precursors to theories (Hesse 1966; Kaplan 1964; Laing 1986; Morrison and Morgan 1999), and exemplars or analogies to something else with similar properties (Kaplan 1964).

Kaplan's (1964) description of the model is most often used to characterize the relationship between digital reference and traditional reference services. Here, the model is defined as an analogy in which one entity has properties of another; thus **A** must be like **B** in some way. Using this notion of the model, the analogy is made that digital reference services **(A)** are modeled after traditional reference services **(B)**. This means that practices such as the reference interview, triage staffing, and the method of question analysis for evaluation are

borrowed from traditional reference services and represented in the practices of digital reference services. Based on traditional reference services, such a model can help to guide and develop the practices of digital reference services, for, according to Lankes and Kasowitz (1998), digital reference is too new to define best practices for itself.

Models are classified in a variety of ways. The following outlines various classes of models, including descriptions, subclasses, and examples:

Descriptive models describe processes and procedures pertaining to a phenomenon (e.g., processes such as listing, linking) and describe variables pertaining to the model. Like other classes of models, descriptive models are often discussed in terms of some function, i.e., as devices that describe, explain, and predict phenomena (Kaplan 1964; Hesse 1966; Morrison and Morgan 1999; O'Shaughnessy 1972). Descriptive models describe what is actually done in real life (Laing 1986). For example, Kuhlthau's information search process model is descriptive in that it represents parts of the real world scenario for information seeking.

Prescriptive models tell what the focus of attention *should* be when making decisions under ideal conditions (Kaplan 1964). An example of this model is the Southern Association of Colleges and Schools' (SACS) accreditation guidelines for universities and colleges or the methodology proposed to conduct academic research.

Normative models tell what the focus of attention *ought* to be or concentrate on established norms (Kaplan 1964). An example of such norms in reference services is the Reference and User Services Association's (RUSA) guidelines for professional librarians' behavior for working at the reference desk.

Decision models are used in decision-making and are of two types: 1) *descriptive models* describe phenomena (Laing 1986); and 2) *prescriptive* and *normative models* tell how you *should* and *ought*, respectively, to make a decision (Lave and March 1993). Lave and March also noted that *normative models* are essentially *prescriptive* and that these models are sometimes hard to distinguish from each other. In making decisions, one tends to weigh consequences, i.e., which event produces the greatest benefit. Generally, probability or decision trees are two types of mathematical tools used to make decisions.

Deterministic models are used to explain phenomena based on cause and effect or are used to explain based on interpretation regarding such occurrences. Such models are of two types: 1) *idiographic models* attempt to explain by providing in-depth understanding

(interpretations) by enumerating specific cases and may be represented in terms of qualitative research (Babbie 2001; Lamiell 1999); and 2) *nomothetic models* attempt to explain in terms of cause and effect and may be represented in terms of quantitative research (Babbie 2001; Lamiell 1999).

Logic models are used to draw inferences based on two types of reasoning: 1) *inductive models* involve reasoning from general to specific. Conclusions are derived from patterns in the data itself (Vadeboncoeur 2001); and 2) *deductive models* involve reasoning from specific to general. Inferences are drawn from predetermined data or from hypotheses or from propositional statements of theories (Vadeboncoeur 2001).

Psychological models are used to understand behavior and mental processes. The *cognitive model* is an example of a psychological model, which deals with mental processes (e.g., information processing such as thinking, problem-solving, decision-making, learning, and the like) (DeMey 1980). These models will be discussed in more detail in the following sections.

Mathematical models use pure or applied mathematics to understand phenomena (Maki 2001). For example, in information retrieval (IR) several mathematical models are used to evaluate computer system performance, such as the matching of user needs to system texts or documents. *Vector space* is a type of mathematical model used to understand IR system performance and depicts relevant documents as geometrically close to each other in the system. Another model, *weigh/rank* depicts relevant items or documents as located at the top of retrieved items in the system (Luhn 1958; Salton 1971).

Analogue models are used to show similarities or to show related properties of phenomena. Such models are of two types: 1) *physical models* resemble some physical structure or scale (Kaplan 1964), e.g., prototypes of systems or city planning structures; and 2) *semantic models* are symbols or conceptual analogues, which Kaplan sometimes discusses as synonymous with *conceptual models*. Borgman (1984), however, presents a more specific subclass for the *conceptual model*, one that pertains to computer systems. Here, the conceptual model represents a design model or represents the system's views of itself. Such a conceptual model might also be considered as a subdivision of a *cognitive model*.

Limitations of Models

Models only represent an aspect of a phenomenon, and thus are a simplification of that phenomenon. That is, life's events are too complex for a model to capture or represent entirely.

Even if it were possible to represent an event wholly by the model, the event would be too difficult to study because of the vast number of variables that the model would have to represent. Thus, some researchers opt to make the model easier to work with by omitting some features of the phenomenon. Such simplification is in accordance with the nature of science. The danger lies in oversimplification when important variables are omitted, especially if the missing variables provide important features or understanding about the phenomenon. As a result, such omissions of variables may result in a distorted view of the phenomenon (Kaplan 1964; Lave and March 1993; Laing 1986).

Another limitation of models, according to Kaplan (1964), is that much of the modeler's understanding about a phenomenon is speculative. Hence, such predetermined views may result in occluding other ideas about the phenomenon represented by the model. Kaplan notes that sometimes models are built when some stages of human knowledge are still immature. Thus, rather than building models, time might be better spent acquiring more knowledge about the subject matter pertaining to the phenomenon of interest. According to Kaplan, when limited knowledge exists for the phenomenon and when this limited knowledge is incorporated into the model, the model only helps to crystallize thinking at a stage when thinking is not fully developed. This obviously results in poor conceptualization and representation of the phenomenon by the model.

For the remainder of this dissertation, models are defined as simplified representations of the real world, including their physical and conceptual properties. Models serve as tools or instruments for understanding and guiding research and practice and serve as precursors to theories. Because of the tendency to equate models and theories, models are defined also in terms of their predictive and explanatory powers. However, explanations and predictions by models generally account for a narrow scope of phenomena, while explanations and predictions by theories generally account for the broad scope of phenomena.

What Are Cognitive Models?

In previous discussions, cognitive models have been broadly classified and defined as conceptual or psychological tools used to understand information processing. These models have been referred to by many different names in library and information science (LIS), for example, the cognitive perspective (DeMey 1980), a mental model (Marchionini 1995), formal theories (Rivers 1990), and the cognitive viewpoint (Belkin 1990).

De Mey (1980), an early proponent of the cognitive perspective in information science, described the perspective as the processing of information whether perceptual or symbolic, as mediated by a system of categories or concepts, which for information-processing devices such as computers is a model of the world. In essence, humans and computers process information based on their knowledge structure, which is represented or perceived in the minds of humans as concepts and categories or represented in the central processing units of computers as symbols and concepts about the world. Cognitive models or the cognitive perspective are used in LIS to study users' information needs, seeking, and use. That is, these models are used to study how humans think, make decisions, solve problems, and the like, within an information environment. Cognitive models are also used to study how users' affective states alter their cognition and actions during information seeking activities.

According to Daniels (1986), many different disciplines have interest in cognitive science (cognitive psychology, linguistics, artificial intelligence, philosophy, education, and information science). They incorporate specific areas of information processing research such as:

- Cognitive psychology – Memory, perception, problem solving, thinking, etc.;
- Linguistics – Semantics and syntax statements;
- Information Science - Problem solving, learning, decision-making, etc.;
- Computer Science - Data processing, problem solving;
- Engineering - Design, problem-solving;
- Education – Learning.

Rivers (1990) defined the cognitive model in terms of a theory. He stated, "Cognitive modeling techniques are more or less formal theories about how people learn and make decisions" (p. 88). This perspective is consistent with the constructivist view proposed by Dervin's sense-making theory, which states that people use information and related resources to interpret or understand their life-world (Dervin and Nilan 1986).

Advantages and Disadvantages of Cognitive Models.

Cognitive models have many of the same advantages as models in general; like general models, according to Wilson (1999) and Saracevic (1997), cognitive models have limited predictive and explanatory powers and may evolve into statements of relationships among theoretical propositions. Cognitive models provide a framework for thinking about a problem in a certain way. Cognitive models may describe information seeking behaviors, their cause, and

outcomes, or the relationships among stages in information seeking. Richardson (1995) also indicates that cognitive models could serve as instructional tools to teach a systematic approach for a process behavior, for example, its cause and outcomes, or the relationships among stages in information seeking.

Several limitations of models in general, discussed earlier in this chapter, also describe the weaknesses of cognitive models. For example, both Wilson (1999) and Saracevic (1997) agree with Kaplan's (1964) view that models only represent an aspect and not the totality of reality. This depiction of cognitive models, according to DeMey (1980), is applicable to both humans and computers. Many limitations of cognitive models pertain to the complex nature of human beings. Norman (1983) indicates that the mental models of human beings:

- are incomplete and unstable (people forget or do not know details);
- do not have firm boundaries, and people may confuse the devices and operations of one model with another;
- often are unscientific, and people maintain superstitious behavior patterns rather than learning newer, more efficient patterns;
- are parsimonious, (i.e., people will do extra operations rather than perform the mental planning to help them avoid the extra work) (p.8).

Cognitive Models of Information Need, Seeking, and Use.

The information need, at the core of the reference interaction, is characterized in many different ways: as an area of doubt (Taylor 1968), as a cognitive gap (Dervin and Nilan 1986), and as an anomaly (Belkin, Oddy, and Brooks 1982). In general, information need, seeking, and use is described as a phenomenon concerning human beings in a state of uncertainty and their decision to search for and use information to reduce that uncertainty. It is the information need that induces a user to conduct an information seeking act (Hansen 1998), and information seeking often results in the presentation of the information need, in the form of a question, to the information system. Further, information seeking is described as a dynamic and action-oriented process (Marchionini 1995; Budd 2001); a sense-making process (Dervin and Nilan 1986); a process involving factors such as user preferences, knowledge, tasks and goals, information object, domain, and user satisfaction (Hansen 1998); and a process generated by the user's mental models (Marchionini 1995). Theory development has been slow in the area of information need, seeking, and use due to the lack of cumulative research, inadequate

methodologies, definitional problems, and difficulties separating the concept from *want* (Wilson 1981; Dervin and Nilan 1986; Paisley 1968; Menzel 1966).[3]

According to Pettigrew, Fidel, and Bruce (2001), the cognitive perspective in LIS focuses mainly on the individual and on understanding the way each individual thinks, feels, and behaves in response to an information need. However, some people might view the same event from different perspectives and emphasize different aspects of the event, or might interpret some aspects of the event as more important than others. For example, various researchers perceive the phenomenon of information need, seeking, and use differently. As a result, there are many models in LIS representing the same phenomenon (McCain and Segal 1969).

The cognitive perspective is also used to explain and predict user-librarian interactions during the reference process (Taylor 1968; Markey 1981; White 1983). Here, the cognitive approach is essentially used to study the reference interview, which involves the interaction between user and librarian to clarify the user's need. In such a study, Taylor (1968) presented four levels of the user need or question formulation: visceral need (ill-defined need); conscious need (in the brain); compromised need (expressed need); and formulated need (statement presented to the librarian of the need). Taylor's research focused mainly on the visceral or unexpressed need, which is also referred to as a cognitive gap (Dervin and Nilan 1986) and an anomalous state of knowledge (ASK) (Belkin, Oddly, and Brooks 1982). Taylor's model is considered the precursor to the cognitive perspective in information studies. Markey (1981) likened Taylor's (1968) visceral need or dissatisfaction to the theory of cognitive dissonance, which represents a conceptual conflict or mental discord, which humans strive to reduce in a variety of ways, including the seeking of information. Unlike Taylor (1968), White proposed an additional stage, Q5, and she described the reference interview as a back and forth movement rather than as a linear process as Taylor does. White (1983) recognized that identification of the information need entailed going back and forth between stages until a match is found between the mental models of the user and the librarian. She believed that this back and forth process allows the librarian to adjust for errors during the reference interview.

[3] *Want* is usually a non-contestable concept as opposed to need. That is, *want* pertains to an individual's personal desire that generally is easily articulated. Need, on the other hand, is usually connected to some goal of the individual and is sometimes conscious or unconscious. Needs are sometimes difficult for the individual to clearly articulate (Green 1990).

Variations exist as to how to clarify the information need. Like Taylor, Markey (1981) recommended passing the question through a number of filters. Additionally, Markey indicated that either user or librarian might present the need to the information system. White (1983) proposed a match between mental models of user and librarian, which enabled the librarian to extract the relevant information needed to clarify the user's question. That is, during the question-negotiation, the librarian usually understands the user's need when s/he is able to match her or his knowledge about the system and its resources with the information that the user reveals about his or her need.

Major Cognitive Models in LIS.

In library settings, much information seeking occurs in reference services (Ingwersen 1992). Several cognitive models have been constructed in LIS to understand information seeking from both a broad and a narrow perspective. Many of these models represent Taylor's (1968) notion of the information need in some way (e.g., Wilson's information behavior model, Kuhlthau's information search process (ISP) model, and Ingwersen's polyrepresentation model). Kuhlthau's model represents users' experiences during the search process. Today, much information seeking occurs in the digital environment, where computer and telecommunication technologies are prevalent. Ingwersen's polyrepresentation model provides insight pertaining to both human and computer interactions. Wilson (1999) considers the search process as an area of information seeking. Unlike many other cognitive models, the information behavior model provides a more comprehensive view of the user's search activity. There are at least four common concepts represented in each of these cognitive models: the user, information, information need, and information seeking.

The User

The central concept of information seeking is the user. Generally, the user is characterized as an individual who experiences some discrepancy in his or her state of knowledge. As a result, the user attempts to reduce feelings of inadequacy by seeking information. This depiction of the user is present in many of the cognitive models in LIS. When users contact information systems such as a traditional reference service or a digital reference service, intermediaries (human or non-human) generally assist them with their information need.

Kuhlthau's (1991) ISP model represents users' task situations, i.e., the information search process. Kuhlthau describes users' search processes sequentially. Her model also represents the

various cognitive, affective, and action/situational states of users as they go through the various stages of the search process. The ISP consists of six stages:

- Stage 1: Initiation. Users realize the need for information and recognize their lack of knowledge or understanding. Information seeking may be invoked. Feelings of apprehension are prevalent.
- Stage 2: Selection. Users identify the general topic or approach and feel optimistic. An action taken by the user is to consult with others.
- Stage 3: Exploration. Users try to become informed enough to form a personal point of view on their topic. Actions taken include locating information about the general topic, reading, and relating the information to what is known already. Users have feelings of confusion, uncertainty, and doubt. In this stage some users may abandon their search altogether.
- Stage 4: Formulation. The user's topic is narrowed and a hypothesis-like focus is formulated. Feelings of uncertainty diminish and confidence and clarity increase. This stage is described as the turning point in the information seeking process. A sudden moment of insight may be seen in this stage. Because of the importance of gaining a focus, this stage is considered the most significant.
- Stage 5: Collection. Users interact most effectively with the information system and have a surge in confidence. They focus on defining, extending and supporting the topic. Confidence mounts as users make detailed notes on information pertaining to their main focus.
- Stage 6: Presentation. Users complete the task and feel relieved and have a sense of satisfaction.

Considering the ISP, its stages, and the digital environment, the following questions are raised: do current predictions pertaining to the ISP model hold true in the digital reference environment? That is, do digital reference users go through the ISP stages? Kuhlthau's model was developed following students at the onset of their search situation. Given this view and given vast amounts of information available on the Web, including library resources, some users may search online resources prior to contacting the human-intermediated digital reference service. Presumably, these users contacted the digital reference service upon failing to find relevant information on their topics. In these instances, researchers using the ISP in their studies might find it difficult to find users at initial stages of their search process.

In Kuhlthau's (1991) model, affective states run across the various stages of the ISP. According to Pettigrew, Fidel, and Bruce (2001), each stage represents a fundamentally unique response by an individual, at a point in time, when engaging in a specific information seeking act. Kuhlthau, in developing the ISP, was influenced by Taylor's (1968) levels of users' needs and Belkin's ASK models (Belkin, Oddy, and Brooks 1982). This model hypothesizes that feelings of uncertainty in relation to information seeking give rise to feelings of doubt, confusion, and frustration and that, as the search process proceeds and is increasingly successful, those feelings of uncertainty change as users receive relevant information. Hence, users' confidence increases and they feel a sense of relief and satisfaction as the search proceeds.

In the traditional information retrieval (IR) model, the system was the focus of attention and the user was just a minor entity in the big picture of system performance. IR interaction models were developed as a result of this weakness in traditional IR models, whereby focus was on retrieval performance, particularly the system's capacity to retrieve document representations that matched the user's query (Saracevic 1996; Ingwersen 1992). In contrast, IR interaction models depict the user as the primary component in IR interaction and depict complexities and attributes of users interacting with computer information systems. Ingwersen's (1992, 1996) polyrepresentation is an IR interaction model, which in IR is defined in terms of human-computer interactions. That is, interaction is a dialogue or exchange of information between participants (users and the system) in which each participant uses the exchange to change the state of itself or to change the state of others participating in the interaction (Storrs 1994, 181). According to Saracevic (1997), exchanges through the intermediary/interface side of the system are intended to specify and modify the user's problem, select files, search terms, and revise search tactics (e.g., browsing rather than structured searching). Such actions are required for users to make or change relevance inferences and make decisions.

The polyrepresentation interaction model involves multiple knowledge or cognitive structures for information processing. Interaction includes two major entities, the user and the information system (which includes the librarian). The user's cognitive structure is referred to as the user's cognitive space and is comprised of the user's problem, current state of knowledge, problem space, and workspace. The system's cognitive space is comprised of the system setting, the content within the system, and the system interface/intermediary. Cognition, in general, is derived from humans whether in users or encoded in the system. Hence, the knowledge structure

in the system's content is derived from indexers and authors of the content (IR objects), whereas the knowledge structure in the system's setting is derived from system designers who encoded algorithms or rules to represent the system content (objects).[4] Moreover, the same system content represented in one database may be also represented in another databases, but the content retrieval depends on the terminology each database uses to represent the content. Because there is polyrepresentation or overlap between similar documents stored in multiple databases for the same system or overlap between various search terminologies used by librarians, users, and system indexers, the probability of users retrieving useful documents is enhanced. Further, multiple representations in the users' cognitive space result in users presenting more defined problem statements and more precise search language to the system intermediary/interface when retrieving documents from the system. If the information is perceived, this information can change the user's knowledge structure or the user's understanding of the world. Thus, in the polyrepresentation model, interactions occur at various levels and are of various types (Ingwersen 1992, 1996, 1999; Saracevic 1996). The best retrieval, according to Ingwersen, is in the area of overlap among these multiple knowledge structures. Polyrepresentation accurately represents users interacting with IR systems via the human or non-human intermediary.

Wilson's (1981) information behavior model is a general cognitive model that represents the broad context of the user's information need, seeking, and use. He suggests that it is the user's perceived need that invokes information seeking behavior, which may result in the user making demands on the information system in order to satisfy this need. The model depicts information needs as arising out of basic needs, which are described as secondary needs such as physiological, cognitive, and affective states. The context of any one of these needs may be the user him or herself, or roles related to work or life, or the environment (political, economic, technological, sociological) for which life or work takes place. Barriers that impede information seeking will also arise out of these same contexts.

The information behavior model also indicates that people do not always seek information from information systems and that information seeking may begin with individuals searching their personal files or with individuals contacting other persons. The information behavior model also suggests that when the desired information is found, information seekers

[4] System setting consists of IR implemented settings such as search language/IR technique, database structure, and indexing rules/computational logic (Ingwersen 1992).

may use the information themselves or may transfer the information to someone else, which the model represents as information transfer. Unlike previously discussed models, Wilson's model shows specific factors affecting information seeking that may determine the user's success or failure in finding relevant information. Users' successful retrieval of information may fully or partially satisfy their information need. Users' failure to satisfy their information need may result in a reiteration of the search process.

Information Need

In LIS literature, the concept of information need is typically synonymous with the anomalous state of knowledge (ASK) (Belkin, Oddy, and Brooks 1982), uncertainty (Kuhlthau 1991), and cognitive gap (Dervin and Nilan 1986). Taylor's (1968) question negotiation, a seminal concept in LIS, provides key insight into the minds of information seekers at various levels of need prior to and when approaching the information system for assistance. Taylor describes these needs as follows:

- Visceral need is a vague and unexpressed need for information.
- Conscious need is an ill-defined or ambiguous mental description of the need within the brain or mind.
- Formalized need is a concrete formal statement of need (the librarian may be viewed as part of the system).
- Compromised need is the question as presented to the information system, which includes the librarian.

According to Belkin, Oddy, and Brooks (1982) the information need is the root of the user's problem situation. To reveal the information need, which is also referred to as an anomalous state of knowledge (ASK) by Belkin, Taylor (1968) proposes putting the query (problem statement) through various filters in order to isolate the specific information need. On the other hand, Belkin et al. suggest using open-ended interviews to categorize the various problem statements. They consider the information need as existing on a scale or continuum ranging from unspecified (unperceived) needs to specified (perceived needs) (Belkin, Oddy, and Brook 1982). Both the Kuhlthau and Ingwersen models depict the information need on a continuum, but Wilson describes the information need as a consequence of existing information needs.

Kuhlthau (1991) defines the information need as a gap in the user's state of knowledge regarding the problem situation. Like Belkin, Oddy, and Brooks (1982), Kuhlthau indicates that these needs appear on a continuum ranging from unspecified to specified needs. In other words, Kuhlthau sees the continuum ranging from questions (Taylor 1968), to problems (Belkin, Oddy, and Brooks 1982) to sense-making (Kelly 1963; Dervin, 1977, 1999), suggesting that the information need is dynamic rather than stable. According to Kuhlthau, as users move through this continuum of needs, their relevance judgments change as they gain more information pertaining to the need. In the ISP, users' focus or sense-making usually begins at the level of formulated needs, which reside closest to the specified needs of the cognitive gap scale. More importantly, during the ISP, emotions or feelings (affective states) are major factors influencing users' cognitive states and actions taken.

On the other hand, Ingwersen's (1996) polyrepresentation model incorporates several components related to the information need into the user's cognitive space: the user's work task/interest, current cognitive state, problem/goal, uncertainty, information need, and information behavior. However, Kuhlthau (1991) and Taylor (1968) represent uncertainty and Belkin, Oddy, and Brooks (1982) represent problem/goals as *the* information need.

Ingwersen (1996) also states that the information need can be ill-defined or well-defined and that it can be stable or variable. He indicates that the user's current knowledge structure, the problem, and uncertainty states are variable needs that invoke learning processes. Ingwersen considers the user's work tasks as stable information needs, and it is the user's work tasks or interests that trigger the information need in the first place (e.g., writing a research paper, developing a proposal, preparing for a lecture, and the like). According to Ingwersen, the stability or variability of the information need indicates the level of intentionality (purpose) and curiosity of the searcher or information seeker. That is, persons with stable information needs may be less curious and may have low intent concerning their search for information, whereas persons with variable information needs may be more curious and have high intent or purpose concerning their search for information. This variability of the information need is described by Bates (1989) as berry-picking, a concept she bases on empirical studies that describe the fluctuation of the user's information need during the search process.

Hence, the various needs represented in the polyrepresentation model interrelate with other cognitive structures within the user's cognitive space, which can generally be characterized

as affective, cognitive, and activity/situational states (e.g., work roles). Social and environmental factors, the user's own current model of the world (current cognitive state), and the user's domain knowledge also impact structures within the user's cognitive space.

Like Ingwersen (1996), Wilson's (1981) information behavior model provides multiple components for the information need, thus providing more in-depth descriptions of the information needs than some other cognitive models in LIS. The information behavior model includes three types of information needs: physiological, psychological (affective and cognitive), and environmental needs. According to Wilson, these needs interrelate to give rise to other needs with barriers arising out of the same context as the needs. Thus, affect, cognition, and context/situation (environmental or action) are factors relevant to the information need in each of these models (ISP, polyrepresentation, and information behavior).

Information seeking

The information need is what triggers information seeking in each of these models. Wilson (1981) states that there are various needs related to the individual, which give rise to other needs. He also views the information need as a type of cognitive dissonance, which motivates people, such as digital reference users, to seek information. Discrepancies within users concerning a particular problem situation result in users seeking information in order to resolve these incongruities (Wilson and Walsh 1996). For example, some users expect to find everything on the Internet and when they do not it may cause feelings of dissatisfaction, and the user may in turn contact information systems such as a digital reference service in order to resolve such discrepancies.

Kuhlthau's (1991) ISP represents the user's search process during information seeking, thereby representing active searching to solve some problem state. During information seeking users generally migrate from an initial stage, where they lack focus and have feelings of uncertainty. It is the formulation stage where users gain clarity about their search topic and experience feelings of certainty and satisfaction. As previously stated, this model consists of six stages with each being impacted by users' feelings or emotions.

Ingwersen's (1992, 1996) polyrepresentation model predicts that users will search the IR system via the computer interface or via the librarian, the human intermediary in the system. It is through the intermediary/interface that users present their problem in the form of a question or search terms to the information system, and it is through this medium that a match occurs

between system documents and users' queries. System settings include codes to enable the matching of similar representations of knowledge between the user (search term) and the system content (indexing and thesaurus terms). The best retrieval, according to Ingwersen, is found in the area of high overlap, which may be considered as the intersection between various system representations of knowledge and the user's representation of his or her problem.

Information

According to Wilson (1981), information is a very ambiguous term, which sometimes varies in meaning in these cognitive models. Ingwersen (1992, 1996) describes two types of information: potential and active. That is, if a user perceives the potential information (data) provided to him or her, information becomes active and can change the user's mental models. Kuhlthau (1991) also indicates that information is something that changes the state of users' knowledge or mental models. Ingwersen's polyrepresentation model also represents the physical form of information as content or documents generated by various authors or indexers. Generators such as systems designers encode the representation of content in the system that is manipulated during the retrieval of information. Wilson provides a multifaceted form of information, wherein information is viewed as a physical entity, factual data, and as a channel of communication (transferring of messages through some channel).

Criticism of Cognitive Models in LIS.

There are a number of strengths and weaknesses for these cognitive models. The strength of Kuhlthau's (1991) model is that it has been tested in a variety of university and school library settings. The model is one of the first to focus on affective states in LIS. Further, the small number of essential variables represented in the ISP allows simple representation of information seeking, thus making the model easy to use in the various library settings for which it is tested.

Kuhlthau tested the ISP model in three types of library settings (public, academic, and school libraries) using both quantitative and qualitative methods. She used random sampling of large populations and generalized the model to larger populations. Thus, in contrast to a number of other cognitive models in LIS, the ISP may be more explanatory, predictive, and testable. Sugar (1995) asserts that the ISP model focuses too much on feelings or affective dimensions, and he indicates that methods for testing the model are not effective enough to capture these dimensions.

The ISP model serves as a useful learning aid for LIS practice, specifically in the area of bibliographic instruction (BI). Also, the model might serve as a tool for BI librarians to understand information seekers during their search process. That is, the ISP might be used to predict users' emotions, thinking, and actions at various stages of the search process, enabling BI librarians to prepare their instructional sessions accordingly. Kuhlthau's ISP is limited in its representation of human-computer interaction and might not adequately represent various user activities in the digital environment.

Some strengths of Wilson's information behavior model are that the model provides both a broad representation and a clear depiction of the phenomenon of information need, seeking, and use. However, this general depiction by the model suggests the existence of large numbers of important variables and, thus the complexity of the model. Moreover, a main critic of the model is Wilson (1999) himself. He states that the information behavior model is mostly conceptual and has not been tested. Additionally, Wilson states that the model does not have processes describing the context of the various information needs affecting individuals, factors resulting in perceptions of barriers, or processes describing whether the assumed barriers have similar or different effects on the motivation of individuals seeking information.

Criticisms of polyrepresentation concern the development of the model, problems involving interactions in general, methodology, and testability. Spink (1999) considers polyrepresentation to be the most developed IR cognitive model. The model represents multiple cognitive perspectives for both the user and the IR system. Some weaknesses of polyrepresentation are represented in Saracevic, Mokros, and Su's (1990) description of the development and difficulty in studying interaction models in general. They state that many variables involved in IR interaction have not been confirmed because interaction is still in its infancy. As a result, primary activities of many interaction studies include classifying variables. Saracevic, Mokros, and Su further assert that collecting real-life data from observations is difficult due to laborious tasks such as the coding of interactions. Another weakness of the polyrepresentation model, according to Wilson (1999), is that all facets for IR interaction are incorporated in the user's cognitive space. That is, the user's cognitive space includes uncertainty, goals, the problem, information need, and the like. Wilson also indicates that polyrepresentation has not been tested. Although the model accounts for affective states in the user's cognitive space, Burnett and McKinley (1998) indicate that polyrepresentation

inadequately accounts for the role of affective states concerning users' motivation to seek information or their response to information (p. 296).

Contributions of Cognitive Models to LIS.

How have these cognitive models contributed to the field of LIS? The testing of Kuhlthau's (1991) ISP model indicates that it is valid and reliable, and is a useful tool for explaining and predicting users' search process. That is, the model enables BI librarians to understand users' affective states during the various stages of the search processes, specifically when users are more frustrated or more focused in their search process.

Further, Wilson (1999) has noted similarities between Kuhlthau's (1991) and Ellis's (1989, 1993) models and has linked both these models to his own information behavior model. Both are based on active searching to solve some problem state. Kuhlthau's model describes various stages of the search process and provides predictions about the affective states of users in each stage. Ellis's information seeking model describes the relevant features or patterns of users during information seeking. Unlike Kuhlthau's ISP stages, Ellis's information seeking model features do not occur sequentially. Wilson believes that supplementing his model with Ellis's and Kuhlthau's will make information behavior a more comprehensive and predictive model.

Spink (1999), as noted earlier, considers polyrepresentation to be the most developed model of IR interaction. Also, polyrepresentation has played a role in the development of other models. The model appears to have influenced Saracevic (1997) in developing his stratified model, which is also an IR interaction model. Like polyrepresentation, the human side of the stratified model has cognitive, affective, and situational subcomponents. The system side of the stratified model has content, engineering, and related subcomponents. Further, polyrepresentation has promoted thinking in LIS practice concerning cognitive overlaps during the searching of IR systems. According to Ingwersen, the best retrieval is found in the area of overlap, which has implications for the areas of indexing and thesaurus construction.

Applications of Cognitive Models to Digital Reference Services.

Digital reference is the provision of reference services via the Internet. These services have evolved from and have modeled the practices of traditional reference services, including the reference interview, staffing, and evaluation. The difference is that traditional reference services generally have been provided to users face-to-face in a physical library and that digital reference services generally have been provided to users remotely via the Internet.

Reference is a user-centered service. Thus, it is useful to determine the value of such services from its users' perspectives. Essentially, the development of traditional reference services has been too mechanistic and systems-oriented, developing with little or no input from those for whom the service is designed, the user (Dervin and Nilan, 1986). This systems-oriented approach has continued in the digital reference environment, where services also have been developed primarily from librarians' perception of need, rather than from users' perception of need. Because the cognitive perspective focuses mainly on the individual and on understanding the way each individual thinks, feels, and behaves in response to information needs, such a perspective might provide insight into the life-world of users of digital reference services.

There is little evidence that existing cognitive models of information need, seeking, and use have been used to study digital reference services, other then Smyth (2003) and Miwa (2000), who both used Berkowitz's Big6™ cognitive model. However, several cognitive models were formally used in traditional reference services and information retrieval to understand problem-solving and information processing of users seeking information. Such uses of these models in reference services suggest that the previously discussed cognitive models also might be appropriate for the digital reference context. This requires testing of these models in a variety of digital reference contexts to confirm or disconfirm their appropriateness to the digital reference context. However, until sufficient testing is done, a number of proposals can be made for the application of such models to the digital reference context.

For example, an hypothesis was derived by Kuhlthau (1991) for the ISP model, which may be used or modified and applied to the digital reference context: digital reference users, at the onset of a problem situation, tend to move from a state of high uncertainty (feelings of doubt, frustration, and confusion) to a state of less uncertainty (feelings of confidence and/or satisfaction) as they meet their information need. Hypothesis testing might be used to determine whether uncertainty indeed decreases as the search process progresses during a digital reference transaction. Whether to reject or not reject the hypothesis is based on findings from data collected at a designated probability level.

Most recently, Smyth (2003) conducted a study that applied a cognitive model in the digital reference context. She used three models, one of which was Berkowitz's Big6™ cognitive model to classify chat digital reference questions from students (Cottrell and Eisenberg

2001; Eisenberg and Berkowitz 1990). The Big6™ is a problem-solving model that describes six stages which students or users undergo when solving information problems:

1. Task definition involves clearly defining the information problem and determining its requirements. This stage incorporates Kuhlthau's stage 2 (selection).
2. Information seeking strategies involve making decisions about choosing appropriate information sources and involve using various criteria to make these decisions (e.g., accuracy, reliability, ease of use, availability, comprehensibility, and authority). This stage incorporates Kuhlthau's stage 3 (exploration).
3. Location and access entail the implementation of information seeking strategies to locate, access, and search sources and to develop general problem-solving skills in information seeking. This stage incorporates Kuhlthau's stage 3 (exploration).
4. Use of information entails engaging with the information in the sources via reading, listening, viewing, questioning, and reflecting and entails making decisions about the relevance and extraction of information. This stage incorporates Kuhlthau's stages 3 and 5 (exploration and collection, respectively).
5. Synthesis entails organizing or repackaging information from multiple sources and the presentation of information.
6. Evaluation involves the assessment of the information problem-solving process, i.e., making judgments about the effectiveness and the efficiency of the process. This also involves assessing whether the information found meets the needs of the information seeker.

Findings from Smyth's study indicate that students had gone through five stages of the Big6™ upon initial contact with the digital reference service, which has implications for Kuhlthau's ISP model. Smyth notes that students were at advanced levels of the Big6™. However, Smyth believes that the Big6™ does not adequately account for librarians' contributions to the problem-solving process during information seeking. She indicates that the Big6™ does not enable librarians to classify users' questions pertaining to circulation policies, related policies and procedures, or technological problems. Considering that stages 3 and 5 of the ISP model are incorporated in stages 2, 3, and 4 of the Big6™ and that the stages of the ISP are sequential, it is possible that such students also might go through five stages of the ISP prior

to contacting the digital reference service. However, to be sure about the appropriateness of Kuhlthau's ISP to the digital reference context requires testing of the model in this context.

Wilson's (1981) information behavior model is often cited and is generally accepted within the LIS community as a representation of the broad context of information need, seeking, and use. In the digital environment, information seeking concerns an information seeker with a recognized need who engages in information seeking by contacting the digital reference service. To meet his or her information need, such information seekers sometimes contact other persons or personal files prior to making demands on the digital reference service. While seeking information at the digital reference service, there also may be an information exchange between user and librarian and a transfer of information.

Wilson (1981) has also proposed hypotheses for the information behavior model that can be modified and tested in the digital reference context; for example, during information seeking in digital reference services, the information seeker is likely to encounter certain barriers arising out of the context of his or her need. This means that, when collaborative tools are used during a digital reference encounter for searching or instruction/demonstration, users may experience difficulties related to links pushed to them and the like. Such barriers may, in turn, impact the users' success or failure during the digital reference service encounter. Hypothesis testing can also be used to test this assumption pertaining to these barriers.

A number of other questions can be asked concerning users' experiences during their digital reference encounter, specifically ones involving collaborative tools. For example:

- How do users handle difficulties during collaborative digital reference encounters? This question aims to understand how users recover from experiences that delay or prevent their goals during collaborative digital reference encounters.
- What variables relate to experiences of users as they encounter digital reference services? This question aims to identify individual variables that describe specific digital reference experiences during a digital reference encounter. Possible variables that might emerge when users encounter barriers during chat digital reference encounters include: specific types of questions, emotions, thinking, actions, and other characteristics.

Ingwersen (1999) also proposed hypotheses that can be modified and tested in the digital reference context. One such hypothesis is: data perceived by digital reference information seekers can change information seekers' cognitive structures. This data can be dependent on

factors affecting the knowledge structures of information seekers (e.g., factors such as situational and domain knowledge structures). Again, hypothesis testing at a designated probability level can be used to test this hypothesis (quantitative). Hypothesis testing also can be done qualitatively, according to Richards (2005) by searching for patterns related to the phenomenon within data.

Another application of polyrepresentation to digital reference services is the use of various properties of the model to describe components of a digital reference service or system. For example, digital reference systems that use advanced delivery technologies, such as the Web contact center, include multiple cognitive knowledge structures (system content, generator knowledge structure, and intermediaries/interface knowledge structures). Content represents knowledge structures in bibliographic databases, the OPAC, FAQs, and archival databases and various other resources of the digital reference system. Other knowledge structures in the system include system generators (catalogers, indexers, publishers, and other generators), who create the system content. Human intermediaries also have knowledge structures represented in the system. Typically, these intermediaries acquired knowledge structures through training related to information retrieval activities (e.g., the reference interview; database selection, access, and searching strategies; and related activities). This knowledge structure enables human intermediaries to understand users' needs and allows them to utilize digital reference technological and bibliographical resources effectively. So it seems that the polyrepresentation model provides a conceptual framework, which can help us understand the training needs of human intermediaries and can help digital reference service providers to predict the various training needs of these individuals.

Digital reference users also possess knowledge structures, which comprise their problems, goals/objectives, problem space, current state of knowledge, and workspace. When seeking information, digital reference users may interact with various content in the digital reference system themselves via the computer interface, or users might interact via a human intermediary, who might search system content on their behalf. Environmental, emotional, and other factors sometimes affect cognitive structures of digital reference users, thus causing user needs to vary. According to the polyrepresentation model, there is overlap among various cognitive structures and the overlap occurring among these provide the best retrieval for users. Such overlap includes the intersection between the various cognitive structures within the digital

reference user (i.e., the users' cognitive space), between the user and system content, between the user and the intermediary, and between various other system components and the user.

Thus, these cognitive models of information seeking have properties that are applicable to information seeking in digital reference services. As an interaction model for information seeking, polyrepresentation focuses on the interplay between the cognitive structures of the user and the digital reference system and the interplay between the cognitive structures within the digital reference user himself or herself. Thus, polyrepresentation might be considered a specific or less general cognitive model that focuses on human-computer interactions during information seeking. In contrast, the ISP is a more general cognitive model of information seeking, while the information behavior model is a more general cognitive model that represents the broader context of information need, seeking, and use. It is possible that each of these models might be used to better understand digital reference users. Confirmation of this requires testing in various digital reference contexts to assess the models' appropriateness to those contexts, and if a model fits, this will in turn provide better explanations and predictions about digital reference services.

Use of Cognitive Models for This Study.

The previous section has proposed some applications of cognitive models to the digital reference context. Such models also might be used as heuristic aids to guide this study, which seeks an understanding of digital reference users. The study investigates users' experiences during digital reference encounters employing collaborative tools. The study provides knowledge about users, their information need and seeking, including barriers affecting their success and failure. It is possible that such a study can provide insight into the mental models of users during their digital reference encounters in an environment utilizing collaborative tools. Much can be learned about digital reference users from their own perspective. Considering this, the study seeks to tell the users' stories through the lens of the cognitive perspective.

The cognitive perspective is used in LIS to study people's information needs, seeking, and use. More specifically, the perspective, according to Pettigrew, Fidel, and Bruce (2001), focuses mainly on the individual and on understanding the way each individual thinks, feels, and behaves in response to his or her information need. Previous discussions of the cognitive models of Kuhlthau, Wilson, and Ingwersen provide three concepts relevant to the human experience: cognitive, affective, and situational/environmental factors (include context and action/physical). These concepts can provide a framework to guide the study within dimensions of the cognitive

perspective. It is possible that data from such a study might allow, through analogy, the researcher to identify and select an appropriate cognitive model of information need, seeking, and use that best represents the experiences of users interacting in a digital reference environment employing collaborative activities such as Web page pushing and co-browsing/escorting.

CHAPTER 2

LITERATURE REVIEW

This literature review focuses on the evolution of digital reference services, concentrating on various models on which services are based, such as traditional reference services, technological models, and reference evaluation. Digital reference services have been characterized as a network of expertise, intermediation and resources put at the disposal of users seeking information over the Internet (Bertot, McClure, and Ryan 2000). These reference services have evolved from asynchronous (e-mail) to synchronous (chat-based) forms of communication. More recently, a number of services have modeled e-commerce technologies (for example, the Web contact center), which allow both asynchronous and synchronous communications to be integrated into one technology. The Web contact center model of digital reference also allows more personalization and collaboration between the user and librarian. These collaborative activities are processes involving information seeking, which is conceptualized as a cognitive process. Searching and instruction/demonstrations are joint activities between user and librarian for which collaborative tools are employed during a digital reference encounter. Seldom does the literature on cognitive processes in digital reference discuss users' experiences during collaborative activities beyond the reference interview. However, it is possible that an understanding of such users' experiences can be understood within the *cognitive perspective*.

According to Pettigrew, Fidel, and Bruce (2001), the cognitive perspective focuses mainly on the individual and on understanding how each individual thinks and behaves in response to an information need. In his seminal paper on *question-negotiation*, Taylor (1968) was one of first to allude to the cognitive perspective in library science. The information need is essentially a mental activity, which takes place in the mind of the user. Taylor's information needs model describes various levels of the user's mental states that evolve from an ill-defined to a recognized state of need, which might prompt the user to contact information systems such as a digital reference service.

When users consult information systems such as digital reference services, reference librarians generally conduct a reference interview through which they try to extract the true

information need from the user's formalized or conscious levels of need. Through the use of collaborative tools, digital reference services allow collaborative activities between the user and the librarian to occur throughout the information seeking event. The extent to which such collaborative tools benefit users is unknown. Through the cognitive perspective, it is possible to better understand users' experiences with digital reference services incorporating collaborative tools. The view of the user represents the user's cognitive model and provides knowledge that can be incorporated into the design and the development of more user-oriented digital reference services.

Traditional Reference Model

The basic practices and methods of digital reference are modeled after traditional reference (Katz 2002). At the core of reference service is the user with an information need presented in the form of a question to the reference librarian. Traditionally, this presentation of the user's question to reference services results in a question-negotiation process between the user and the librarian in order to clarify the needs of the user. Katz refers to this process as the reference interview. The reference interview is modeled in the digital reference process. Unlike traditional reference, where communication between the user and librarian is typically face-to-face in a physical library, digital reference is communication between the user and librarian through the Internet using e-mail, chat, and related technologies. The success or failure of the reference process is contingent upon factors related to the librarian, user, and the interactions between the two. Ultimately, the user judges the success or failure of such interactions (Bopp 2001; Katz 2002). This review will discuss traditional reference services that are modeled in current digital reference services.

Reference Interview

Essential to the success of answering reference questions is the reference interview, in which the librarian determines that the user needs additional assistance such as guidance, instruction, or demonstration in order to better utilize various library resources. Traditionally, the reference interview has been a communication process involving question negotiation, in which librarians try to assist users in clearly articulating their information need within the confines of a problem statement. Researchers have characterized the information need in various ways: a

visceral need (Taylor 1968), an anomaly (Belkin, Oddly, and Brooks 1982); and a cognitive gap (Dervin and Nilan 1986). In order to enhance the quality of the interview and to extract from users their true information need, Katz (2002) has proposed that librarians employ various verbal and nonverbal communication skills such as active listening, good eye contact, and a pleasant disposition. Such communication prompts, though useful in the traditional reference model, are lacking in the digital reference model.

Triage Staffing Models

Triage staffing models have been implemented in both traditional and digital reference services. In this model, easy questions are routed to lower level staff and more complex questions to the reference librarian (Mardikian and Kesselman 1995; Lankes 1998). The goal is to add more efficiency to reference services by freeing reference librarians to develop new resources and services to better assist users.

Warner (2001) discusses some decision-making challenges for paraprofessionals participating in triage during the provision of traditional reference services. She indicates that paraprofessional staff sometimes have difficulty knowing which types of questions should be referred to reference librarians. This challenge seems to have been alleviated by Lankes (1998), a co-founder of the AskEric digital reference project. Like Mardikian and Kesselman (1995), Lankes proposes a triage model for an e-mail reference service in which questions are reviewed and routed to the appropriate person for answering. Lankes and colleague have conducted one of the few studies on triage with the aim of identifying best practices for automated triage question-answer exchanges in digital reference services (Pomerantz, et al 2004; Pomerantz, Nicholson, and Lankes 2003).

Technological Delivery Models

Digital reference services have also evolved and have modeled various Internet services. Within the past few years, Internet tools such as the Web have drawn more people and businesses online. This has raised questions about the impact of increased use of the Web on librarianship. One impact is a decrease in traditional reference and circulation statistics (Lipow 1999; Tenopir and Ennis 1998). From such observations, Lipow has suggested that there is a correlation between increased use of the Internet and decreased circulation and reference

statistics in libraries. A "bandwagon" effect soon developed, with Lipow advocating a "point-of-need" reference service model, to meet information seekers where they are in the digital environment. However, the research conducted by Janes, Carter, and Memmott (1999) suggests that this effect was already taking place. These authors examined Web sites of 150 randomly selected Carnegie I academic libraries from 931 universities and found that approximately 45% of these libraries provided digital reference services.

Presumably, the migration of reference services to the Web will revolutionize the library and will allowed a transition to what Al-Hawamdeh and Hart (2002) call the "knowledge society." This revolution in digital reference services will likely change users' expectations, causing them to expect immediate answers to the questions asked via this service. Contributing factors to such a revolution might be attributed to:

- the development of the Web and the ease of navigating in the Web environment;
- the ability to connect various communication technologies such as e-mail, chat, and related technologies within the Web environment; and
- the development of e-commerce technologies such as the Web contact center and instant messaging.

A common component of each of these factors is the Web, which is also a key player in the "knowledge society." Knowledge is defined as active and dynamic information, used for creating, sharing, and using value-added products and services for the prosperity of the society (Al-Hawamdeh and Hart 2002, 3). As a knowledge-based service, digital reference not only provides information to users but also captures and stores information about those users on the system's server log files.[5] Such information might provide evidence of cognitive models for users working in the digital reference context. Users' cognitive models captured by digital reference serve as a source of knowledge that can be used to learn more about users' experiences during digital reference encounters, thereby enabling the library to design and develop more user-oriented digital reference services. Thus, it is useful to understand the origin and evolution of digital reference technologies and the role they play on users of digital reference services.

[5] Server log files are computer-generated records of every request for information from the digital reference service. Recorded information can be used to collect usage, system performance, and other information pertaining to a digital reference transaction (e.g., questions and answers between users and librarians, Web pages pushed, session times (including log-in/disconnect times), user/librarian names, user e-mail address, and a variety of other transactional data). For a more detailed discussion on computer server logs (see Yonaitis 2001; Peters 1993; Peters 1998).

E-Mail Reference

Through the Internet, various delivery models for digital reference have evolved and have emerged as powerful technologies for global communication. Among these models, e-mail is the oldest. 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 in 1984 (Howard and Jankowski 1986; Weise and Borgendale 1986). Typically, such standalone e-mail reference services have not received large volumes of questions. One service received an average of 200 questions per month (Borisovets 1999), while another service received about eight questions per month (Still and Campbell 1993). However, advanced technologies based on the call center model allowing communication via e-mail have received high volumes of questions. Services based on this model include AskEric, the Internet Public Library, and MassAnswer. AskEric services received 4,000 questions per month, while the Internet Public Library (IPL) received 7,054 questions during 1999 (Mon 2000). MassAnswer received 12,367 questions in 2001 when it first opened (QuestionPoint 2006). Such high question counts for AskEric and the IPL might be due to their having technology capable of handling large volumes, their having services geared toward a national user base of educators, school children, and the general public. Many digital reference services affiliated with physical libraries are primarily geared to user populations within specific environments such as a university or local community.

Although e-mail provides the convenience of asking questions of the information service beyond time and geographic location, it has several limitations. First, nonverbal cues such as eye contact are missing (Francoeur 2001; Straw 2000; Fishman 1998; Abels and Liebscher 1994; Roysdon, Elliott, and Elliott 1988). Second, there can be delays between user and librarian messages, which presents challenges during the reference interview (Abels and Liebscher 1994). Finally, the need for clarification and verification of users' questions sometimes results in several back and forth messages, which can be very time consuming.

To alleviate some of the challenges of e-mail reference, the Web form was devised to add more structure to the reference interview. Moreover, Web-based digital reference has been considered an improvement over e-mail, since it allows users to better articulate their information need in writing, and reduces the amount of traffic during digital reference transactions (Abels 1996).

Chat-Based Reference

Janes and Silverstein (2003) report that many digital reference services have evolved to synchronous modes of communication. This communication mode is provided using a variety of technologies. Thus, the authors raise questions as to the appropriate technology for particular digital reference services.

Synchronous communication in the digital environment includes chat-based technologies, and such technologies have evolved from simple chat to the Web contact center. Chat-based and related real-time communication media include the Multi-User Object Oriented (MOO) environment, video conferencing, simple chat, instant messaging (IM), and Web contact centers (Folger 1997; Lessick, Kjaer, and Clancy 1997; Foley 2002; McGlamery and Coffman 2000; Breeding 2001). The move to chat-based reference services was another attempt to alleviate time delays of e-mail and, consequently, was a progression to more immediate, real-time digital reference that emulates telephone and face-to-face reference services. Moreover, authors such as Fagan and Desai (2002/2003), suggest that chat communication technologies can inject warmth and interactivity into the digital reference transaction. They indicate that emoticons and abbreviations add social and emotional elements to the communication, thus making the digital environment more friendly. Because such behaviors are captured in the session transcripts that are used to assess a number of digital reference services (e.g., Ward 2003; Smyth 2003;White, Abels, and Kaske 2003; Radford 2003) chat transcripts might provide interesting data to better understand digital reference users.

Although chat-based reference services are convenient and provide immediate communication, some disadvantages have been associated with this reference model:

- Some librarians exhibit high anxiety and feel pressured when having to answer questions rapidly, particularly in non-visual services where users cannot see the librarian working on their requests (Foley 2002).
- Fast typing skills are required to rapidly provide extensive responses (Foley 2002).
- Some users become impatient and disconnect if librarians take too long, leaving librarians uncertain about the status of the request (McGraw, Heiland, Harris 2003; Foley 2002; Gross et al. 2001). This phenomena of disappearing users are referred by some as user *evaporation* (Janes 2003; Kresh 2002/2003).

Web Contact Center Reference

Although chat digital reference provided the real-time capabilities lacking in e-mail reference, simple chat technologies still lack many of the personalized capabilities of traditional reference, such as visualized and interactive instructions and demonstrations. Such limitations triggered the move to e-commerce models of digital reference services. The emergence of e-commerce technologies, such as the customer relationship management (CRM) call center incorporate collaborative tools, which allowed more personalization and interactivity in digital reference, for example collaborative work and information literacy. The e-commerce model also allowed for the scalability in services, for example an increase in question loads and in the number of consortium digital reference services.

Collaborative Tools.

In digital reference services, the call center model has been referred to as the Web contact center. Many such Web-based applications include collaborative tools such as whiteboards (tools for drawing and graphical displays), co-browsing, Web page pushing, escorting, and other application sharing tools (Coffman 2001; Breeding 2001; McGlamery and Coffman 2000). These application-sharing tools enable both user and librarian to view the same objects on each other's desktop during digital reference transactions and provide opportunities for collaborative activities such as co-browsing, searching, and demonstration/instruction in the digital environment. These activities facilitate collaborative work and information literacy in cyberspace.

Collaborative Work

Computer-supported cooperative work (CSCW) is the use of various computer technologies by two or more persons in order to perform work. Johansen (1988) has categorized CSCW according to time and place:

- Same time, same place – Communication is via instructional support tool (non-networked).
- Same time, different place – Communication is via chat, Internet, and remote databases.
- Different time, different place – Communication is via e-mail, voice mail.
- Different time, same place – Communication is via letters, post-it notes.

According to Twidale, Nichols, and Paice (1997), collaborative work in the digital environment is an interaction that requires the sharing or exchange of information, which is based on the

notion that most people do not work alone but interact with other people in order to complete their tasks. According to these authors, collaboration within the context of reference services involves information seekers (users) and librarians and generally occurs in three ways:

- collaboration between library staff (e.g., reference librarians within and among institutions consult one another to share particular processes or problem solving techniques);
- collaboration between a user and a member of library staff (e.g., user collaborates with librarian to solve their information problem or need); and
- collaboration between library users (e.g., users interact with friends, family, or others to meet their information needs.

Collaboration between a user and library staff is common in both standalone and consortium digital reference services. Although librarians within standalone digital reference services sometimes work together to solve users' problems, collaboration between library staff at participating libraries is paramount for the establishment and the successful operation of consortium digital reference services. The Web contact center is generally the technology supporting such collaborations.

Twidale and Nicholas (1997) indicate that ethnography is the method typically used to study CSCW. In the digital reference environment, it is possible to consider session transcripts from these transactions as artifacts remaining from users' experiences in this environment. Thus, these artifacts from the digital reference transactions, possibly within a two to three year span of transactions, could be used to learn about digital reference users. Such a study within a chat digital reference environment might provide richer data for understanding users' thinking and feelings as opposed to an e-mail environment.

Information Literacy

According to Twidale, Nichols, and Paice (1997) collaborative work is an interaction that requires the sharing or exchange of information, and it is vital that future digital library services continue to support many of these activities. The implementation of collaborative tools in digital reference has allowed collaborative work to extend beyond the reference interview. Moreover, collaborative tools in digital reference have implications for information literacy (i.e., users' information seeking skill development and user empowerment).

ACRL (2000) and AASL/AECT (1998) define information literacy as a set of competencies common to all disciplines. Information literate persons recognize when information is needed. They have the ability to locate, evaluate, and use information effectively. Information literacy forms the basis for life-long learning. It can empower individuals to be self-directed and independent in their learning, and in their personal, professional, and academic lives. Information literacy involves more than the use of information, it also involves the use of technology. For example, in digital reference technological features such as co-browsing/escorting provide personalized demonstration and instruction for users whose questions/problems and attitudes indicate they could benefit from skills' development for information seeking.

Scalability.

Other strengths of Web contact centers include the ability to scale to support a variety of activities. Steve Coffman, an avid promoter of the Web contact center in digital reference, states that the Web contact center can concurrently support many users by maintaining users "on hold" until a librarian is available to assist them; it can support collaborative efforts among libraries providing digital reference services; and it can support the tracking and profiling of users visiting the digital reference service (McGlamery and Coffman 2000). Generally, the Web contact center is more expensive than other applications used to deliver digital reference services; this indeed is a disadvantage.

Consortial Digital Reference Services.

Consortial reference services are at the high-end of electronic reference delivery. Many consortial digital reference services use the Web contact center to collaborate among member libraries and to handle large volumes of questions. According to Francoeur (2001), 77% of libraries providing chat-based reference do so via a consortium. He also reports that two out of eight consortial libraries use AOL Instant Messaging (IM), and six consortial libraries use Web contact center software. Of the Web contact centers, Human Click was the most popular brand used by standalone libraries. This brand was followed by Library Systems and Services, Inc.'s (LSSI) VRD at two consortia and five standalone libraries.

Through the consortium, users have access to digital reference services anytime, anywhere through their national and international collaborative network of participating libraries of various types. Kresh (2001) indicates that libraries participate in consortia to share costs,

staffing, expertise, collections, and time zone differences in order to provide digital reference services to remote users. Some consortial digital reference services include:

- *Virtual Reference Desk Service (VRD),* a consortium primarily geared to the K-12 community. It is sponsored by the Eric Clearinghouse on Information & Technology and funded by the U.S. Department of Education's National Library of Education which is supported by the White House's Office of Science and Technology Policy (Lankes 1998).
- *Collaborative Digital Reference Service (CDRS)*, the first digital reference consortium and currently referred to as QuestionPoint. It involves a cooperation between national and international libraries; it was originated by the Library of Congress (Kresh 2001) but is currently sponsored by OCLC (Penka 2003).
- *24/7 Reference project*, originally established as a cooperation between public libraries in Southern California. It is sponsored by the Metropolitan Cooperative Library System (MCLS) in California (McGlamery and Coffman 2000).
- *Ready for Reference Service*, a cooperation among eight academic libraries in Illinois. The Alliance Library System of Illinois sponsored this consortium (Sloan 2001).

Sloan (2003a) maintains a frequently updated Web site that lists these and other consortial digital reference services.

Joe Janes, a pioneer of the Internet Public Library from which much of what we know about digital reference has been obtained (Gross, McClure, and Lankes 2001), and his colleague Joanne Silverstein have noted some challenges of consortium services. Janes and Silverstein (2003) state that the rise in consortial digital reference services raises questions about the "equitable sharing of questions and resources, specialization of staff and services, trust, and the transportability of the initial reference interview" (para 20).

Although each delivery technology has its own unique characteristics, there are commonalities among all of them. One, they all provide convenient and accessible Internet reference that allows users access without having to come to the physical library. Two, they allow librarians to telecommute. Three, they may lack human visual and audio cues to guide the reference interview (Abels 1996; Foley 2002; Francoeur 2001). Four, because of these technologies, many librarians have had to deal with technological issues outside of their normal job description (Gross et al. 2001). Five, they can capture and store transactional data which can be used to assess user needs, librarian's training needs, and other service needs. However, reuse

of user data raises ethical and political issues about the rights of users' privacy (Foley 2002; Breeding 2001; Gray 2000) and the obligation of librarians to protect those rights. Finally, Abels (1996), an early researcher in the area of e-mail reference, suggests the need for additional research in the area of the e-mail reference interview. Accordingly, additional research is needed in areas of digital reference delivery technologies, in general, to better inform librarians of how to conduct an effective reference interview via the Internet and to inform the library of other digital reference user needs.

Evaluation of Digital Reference Services

Prior to discussing the evaluation of digital reference, it is useful to provide some discussion on evaluation in general, including some of the various approaches to evaluation. Evaluation is a very complex topic and is rooted in the discipline of education. There is also much disagreement on terminology and conceptual issues involving evaluation. However, Worthen, Sanders, and Fitzpatrick (1997) provide a comprehensive definition, defining it as "the identification, clarification, and application of defensible criteria to determine an evaluation object's value (worth or merit), quality, utility, effectiveness, or significance in relation to those criteria" (p. 5). This definition is broad, comprehensive, and adaptable to many of the alternative approaches to evaluation. Essentially, evaluation is making a valued judgment about an evaluand (the object being evaluated) based on some established criteria such as quality, utility, and effectiveness.

Many evaluation approaches proposed in librarianship have been primarily goal or objectives related: objective-oriented (McClure 1994), systems-oriented (Van House, Weil, and McClure 1990), management-oriented (Lancaster 1990) and outcomes-based evaluation (ACRL 1998; Hernon and Dugan 2002a, 2002b; IMLS 2002). A more extensive discussion of these various approaches can be obtained from Worthen, Sanders, and Fitzpatrick (1997), Patton (2002), and Van House, Weil, and McClure (1990).

As previously discussed, digital reference services have evolved from and have been modeled after the practices of traditional reference services. These services have also evolved from and have been modeled after various Internet technologies. Digital reference is a developing service, and it is good to determine the value of such services from its users'

perspective. The development of traditional reference services, upon which digital reference service is modeled, has been too mechanistic and systems-oriented, developing with little or no input from those for whom the service was designed (Dervin and Nilan, 1986). Moreover, the systems-oriented trend of evaluation has continued in digital reference services. Thus, digital reference has developed primarily from librarians' perception of need, rather than from users' perception of need. Hence, there is a void in the literature regarding the users' perspective. Although a number of user-oriented approaches exist, libraries nonetheless persist in using a systems-oriented approach to evaluate the needs of users of digital reference services.

Few studies in the literature actually report on the evaluation of digital reference services (e.g., Pomerantz, Nicholson, and Lankes 2003; White, Abels, and Kaske 2003; Diamond and Pease 2001; White 2001; Carter and Janes 2000; Sower and White 2000). Also, few doctoral dissertations have been developed on the topic: Pomerantz (2003) studied the classification of questions for triage; Southwick (2001) studied the process of human intermediation; Miwa (2000) studied human intermediation and problem solving; and Ford (2003) studied the difference between traditional and digital reference interactions. Lankes and Kasowitz (1998) attributed this deficiency in research to the newness of the concept and to the lack of available information to define best practices for digital reference. However, Kasowitz, Bennett, and Lankes (2000, 357) proposed that "digital reference can borrow from traditional reference in terms of identifying quality characteristics of reference service." They suggested measures of quality standards (i.e., the Virtual Reference Desk's [VRD] Facets of Quality) based on *user transactions* and *service development/management*. The *user transaction* level focused on components from the question-answering process, such as accessibility, prompt turnaround, clear response policy, interactive communication, and instruction. The *service development/management* level focused on decisions pertaining to creating and maintaining the VRD that affect overall quality and user satisfaction.[6] Due to the broad nature of the previous process measures to evaluate digital reference services, including VRD's quality standards, McClure et al. (2002) have proposed a number of more specific measures such as accuracy, courtesy, repeat users, and the like to evaluate digital reference services.

[6]A description of the VRD consortium was previously given in the *Consortium Digital Reference Services* section of this dissertation.

Quality Standards

McClure and Lankes have criticized the VRD's Facets of Quality, as "[being] too broad, non-library specific and [lacking] practical evaluation methods and benchmarks" (McClure and Lankes 2001, 2). As a result, they, along with other colleagues, developed the *Statistics, Measures and Quality Standards for Assessing Digital Reference Library Services*. This manual includes measures, procedures, and guidelines for developing and using quality standards to assess digital reference services. A quality standard is defined as "a level of performance that an organization is willing to accept for a particular service or activity" (McClure et al. 2002, 60). An example of a quality standard for digital reference is: *librarians of the VRD should answer 80% of questions received correctly*. Although there have been discrepancies in libraries about acceptable target levels (Bertot and McClure 2003), such quality standards are intended to produce statistics and measures that will allow libraries to compare digital reference services against one another. As a result, libraries can use such data for accreditation and accountability purposes.

In their manual, McClure et al. (2002) propose a number of quality standards, which include both qualitative and quantitative measures. The authors have left the difficult task of establishing specific levels of attainment for quality standards to individual libraries using them. The Quality standards include:

1. Courtesy - The behavior of the library or institution's staff; the target level: a score of X on a scale of 1 (discourteous) to 7 (very courteous).
2. Accuracy - The "correctness" of answers provided by the digital reference staff; the target level: the library staff will provide a correct answer fill rate of XX%.
3. Satisfaction - Users' determination of their success in interacting with the digital reference service; the target level: a score of X on a scale of 1 (very dissatisfied) to 7 (very satisfied).
4. Repeat users - The percentage of users that reuse a service after first encounters; the target level: at least XX% of all users of the digital reference service will ask two or more questions per week, month, or other time period.
5. Awareness - The population user group's knowledge that the service exists; the target: at least XX% of a specific population group will be aware that the library provides a specific type of digital reference service.

6. Cost - The cost per digital reference; the target level: the cost per digital reference transactions will not exceed $XX.XX.
7. Completion Time - The average completion time; the target level: the average completion time for digital reference transactions will be X amount of time.
8. Accessibility - Ease in finding the service, using the service, and adapting to service software, target level: varies. (p. 60-62)

Of these eight quality standards, numbers one through six appear to have derived from traditional reference services [e.g., courtesy (RUSA 1996), accuracy (Hernon and McClure 1986); repeat user (Durance 1995)].

More recently, Lankes, Gross, and McClure (2003) have proposed two broad areas for quality standards, *utilization* and *technical* dimensions. *Utilization* concerns standards dealing with use and delivery of digital reference services. *Technical* concerns standards dealing with hardware and software, including protocol and computer industry standards, metadata, and organizational business rules.

Through *utilization* standards, according to Lankes, Gross, and McClure (2003), the cost of a digital reference transaction can be determined and costs can then be coupled with the *technical* standard (e.g., by transporting costs along with the reference question) to ease accounting and to establish a "question economy." This coupling would allow digital reference providers, such as consortium members, to possibly auction off or barter for questions. Lankes, Gross, and McClure suggest that having such costs could prove useful in determining what to charge for consortium development.

Most of the eight quality standards developed in the *Statistics, Measures and Quality Standards for Assessing Digital Reference Library Services* manual fall within the dimension of utility. The authors' *technical* dimension applies to industry and to system staff. It is unclear whether any of the eight quality standards fall within this dimension. However, it is possible that the accessibility standard falls within the *technical* dimension, for there are technical issues related to the browser, operating system, and related computer components affecting successful access to the digital reference services.

Advantages of Quality Standards.

There are several advantages to quality standards for reference services. According to Lankes, Gross, and McClure (2003), quality standards encourage discussions among library staff

and administrators about what constitutes quality in digital reference services, and these standards educate new staff as to the expected level of quality that should be provided. Quality standards provide target levels according to which reference services can be judged, and these standards include both quantitative and qualitative components. As previously stated, quality standards provide a basis of rewards to staff and provide a basis of accountability to decision makers.

Disadvantages of Quality Standards.

Some disadvantages of quality standards pertain to delivery technologies and methodology. Since the development of digital reference service is ongoing and since many of the quirks have yet to be resolved, it is difficult for libraries to establish reliable levels of attainment. Further, the lack of human visual, verbal, and audio cues in the digital environment makes it difficult for users of digital reference to accurately judge librarians' behaviors. For example, Sloan (2003b), who maintains a very comprehensive and frequently cited bibliography on digital reference services (Sloan 2000), reported findings from user exit surveys for a digital reference service in which several users commented that the librarian was rude, unfriendly, and mean. Upon further review of these surveys, reviewers found that one user's response was based on a question asked by the librarian after a lag period: "Hello, are you still there?" Another instance of a user reporting that the librarian was rude involved the librarian trying to clarify the user's question. Here, the librarian asked the user, "Could you tell me more?"

The measure *repeat user* also presents a number of challenges to the quality standards proposed by McClure et al. (2003). Many *repeat users* of a digital reference service are not recorded by the system because caching by Internet browsers and other system components maintain various visits to the Web site in memory. Further, a number of people seeking information from e-mail reference services may use several e-mail addresses when contacting the service, thus making it difficult to identify them as repeat users. Moreover, concerns about privacy have resulted in practices whereby many libraries do not collect user names, e-mail addresses, or other personalized information for transactional digital reference data.

The quality standard for *accuracy* has problems linked to the *correct answer fill* rate, which is linked to unobtrusive testing. Traditionally, accuracy was used to measure *correct answer fill rate* in reference services. The assumption was that the behavior of the reference librarian impacted the user's perception of effectiveness of the response. Durrance (1995)

pointed out that, “When measuring reference success . . . one should focus on assessing the quality of the interaction” (p. 244). She suggested that an assumption behind accuracy as a measure of success is that all questions have correct answers and that librarians who do not answer correctly have failed. Thus, Durrance proposed *willingness to return* as a measure of reference success, (i.e., will the person asking the question return to the same staff later with additional questions). A criticism of unobtrusive testing was that librarians were evaluated without their prior knowledge. Also, some people criticized this approach because it uses proxies instead of actual users. Other criticisms concerned the fact that all reference staff are not tested, that many librarians express an aversion to this type of testing, and that there is a lack of consideration of local or unique contexts during testing (Hernon and McClure 1987, 1986).

How useful are the quality standards (McClure et al. 2002) for digital reference? Many of the previously discussed standards are currently used in traditional reference services. Thus, it is possible that these quality standards will be transferable and accepted within the digital reference library community. However, to date, there are no reports outside of the quality standards’ test libraries on the actual use of these standards to assess digital reference services. According to Lankes, Gross, and McClure (2003) the standards are currently being field-tested. As to their actual value and usefulness, we await feedback from the larger library community.

Evaluation Methods

Survey.

A survey "is a system for collecting information to describe, compare, or explain knowledge, attitudes, and behavior" (Fink 1995, 1). This approach uses the questionnaire, the traditional form of survey, whereas Leedy (1997) describes a descriptive form of survey that does not use a questionnaire but uses direct observation of people and objects to collect data. Examples of works reported as surveys that do not use questionnaires include Janes, Carter, and Memmott (1999) and Francoeur (2001).

Generally, researchers conducting surveys using questionnaires have large random samples from diverse populations and services that allow them to make generalizations about the service. Unfortunately, surveys of both e-mail and chat digital reference services have generally suffered from low response rates and small sample sizes, as noted by Gross, McClure, and Lankes (2001). Except for Garnsey and Powell (2000), many researchers of e-mail reference services have typically used questionnaires to assess users’ demands on the service from the

librarian's perspective (e.g., Janes 2002; Bott and Bauerschmidt 1999). Many chat digital reference services have followed this approach (Ronan and Turner 2002; Marsteller and Neuhaus 2001).

Johnson (2004) is one of few researchers to conduct a user-oriented survey of chat digital reference services using a questionnaire. However, these surveys use online pop-up questionnaires (e.g., Broughton 2002/2003; Ruppel and Fagan 2002; Foley 2002), which, according to Nilsen (2004), "do not reflect users who have disappeared during the electronic transaction; unhappy or annoyed users may not bother to fill in the questionnaires, while students completing questionnaires in a class might not be unbiased" (para 15). According to Nilsen, user satisfaction is generally high for pop-up questionnaires. However, this approach to the survey is not considered very systematic, since researchers tend not to know the size of the general population of users from which to draw an appropriate sample size, and thus, cannot generalize to the general population of digital reference users for the service.

Question Analysis.

Question analysis involves the classification of questions through techniques similar to content analysis. Richardson (1995) indicates that the practice of classifying questions originated with Isadore Mudge and Margaret Hutchins, who used this method between 1937 and 1944 to classify reference questions in order to answer them. Questions were classified first by type of format (historical, biographical, bibliographical, and the like) then by specific source within the format. Richardson also states that questions have been classified by type (directional, ready reference, directional, and the like). In addition, questions have been classified by subject, time period, and by language. Several studies have employed question analysis to assess the effectiveness of digital reference services. While this approach provides a useful method for evaluation, many studies do not clearly describe how categories were derived, or only vaguely describe their methods. Useful and replicable studies need to:

- describe the methodology used;
- describe the coding categorization used, including how it was derived; and
- maintain clear, distinguishable categories throughout.

Although question analysis entails classifying questions into different categories in a manner similar to content analysis, it is limited, particularly in studies utilizing e-mail queries, in that it only provides a glimpse into the minds or cognitive structures of users.

Diamond and Pease (2001) provide a good example of research using question analysis. Using an interpretative approach, the authors analyzed 450 reference questions (e-mail transcripts) received at an academic library for August 1997 and May 1999 in order to assess the performance of their library's digital reference service. They state that their classification scheme was derived from the data. These authors presented clearly defined categories independent of each other.

For his doctoral dissertation, Pomerantz (2003) examined question types and other attributes of questions received by digital reference services that affect triage decisions to develop specifications for automating triage in digital reference services. The think-aloud method was used to determine the rules by which questions were assigned and routed by 28 triagers from AskA services, academic, public, and special libraries during August and October 2002. One-hundred eighty-five questions were collected during the think-aloud phase and classified according to Wh-words (including how), function of expected answers, and form of expected answer.[7] A descriptive or quantitative form of content analysis was used to analyze interview and think-aloud data. Codes were validated using nine coders to conduct intercoder reliability. He used Cohen's Kappa coefficient, which ranged from 0.53 to 1.00. Eight attributes of questions and 38 criteria of different types of question were discovered that affected the triage process. Correlations for taxonomies were determined using Cramer's V.

Findings indicate that 40% of questions were classified as *what-description* and *what-selection*. Thirty percent (30%) of questions were classified as *where* and *how* for the wh-words taxonomy. For the function taxonomy, 30% of questions were assigned to the *coverage* subcategory, 16.7% to *request*, and 20% to *quantification* and *verification* subcategories. Approximately half of the questions (50%) in the forms of expected answers taxonomy were assigned to the *factual* subcategory and 23.3% were assigned to the *citation list* subcategory. There was weak correlation between the three question taxonomies and the attributes affecting the triage process. Pomerantz (2003) reports that the correlation between question taxonomies

[7] Pomerantz's (2003) Wh-words taxonomy consisted of what-description, what-selection, where, how, when, what-quantity, which, why, and who. The function of expected answers class consisted of 20 subcategories corresponding to the question type attribute (e.g., coverage, verification, procedural, fill-in-the blank, and other attributes). The expected answer class consisted of 11 subcategories corresponding to the form in which the user specifies that s/he would like the answer presented, e.g., citation list, bibliographic instruction, holdings, known-item search, directional, and other forms (p. 203, 231, 205).

and triage action (categorization of triage internal or external recipients to the digital reference service) ranged from low to moderately high.

To date, many studies analyzing user questions have been of e-mail reference services, and as indicated in the survey section of this review, studies assessing chat digital reference have typically used this approach. However, Smyth (2003) and Ford (2002) deviated from this traditional survey approach of analyzing chat digital reference services. Smyth employed three models in her analysis of questions, while Ford employed discourse analysis and content analysis to analyze questions from and interactions in chat, e-mail, and traditional reference services.

Smyth (2003) provides an interesting study using three models to classify chat digital reference questions from students. The models used were: Sears's (2001) modified version of William Katz's approach for classifying reference questions; ACRL's Information Literacy Competency Standards for Higher Education (2000); and Berkowitz's Big6™ cognitive model (Cottrell and Eisenberg 2001).

Findings from the Sear's classification scheme indicated that many students asked research questions about searching or accessing specific databases. Findings from ACRL's standards suggested that a large number of transcripts were classified within standards one and two, which indicated that students needed help defining their research questions, identifying informational resources, developing search strategies, and locating materials. Smyth (2003), however, did not provide examples from the ACRL model for this as she did for other models in her study.

Findings from the Big6™ indicated that students had gone through five stages of the Big6™ upon initial contact with the digital reference service. Although students were at advanced levels, librarians still had to work students back to initial stages of the Big6™ to clarify their questions. This process corresponds to Taylor's (1968) filtering steps in which librarians, during the reference interview, work users back to earlier levels of need in order to understand their questions. Smyth did not think that the Big6™ allowed librarians to appropriately classify the various activities in a library's digital reference process. For example, the Big6™ did not allow librarians to describe technological difficulties related to computer failures, Web page navigation, authentication issues and related problems.

Smyth (2003) concluded that the modified Katz scheme was most useful in representing the types of question received at the digital reference service. However, Sear's (2001) modified

version of the Katz scheme did not address students' levels of information literacy or stages of the research cycle. ACRL's classification revealed that few of the standards are generally addressed within their reference services. Smyth states that there appeared to be a gap within the Big6™ in representing students' existing knowledge and the actual questions presented to the digital reference service. Also the Big6™ model did not describe many of the questions received at their digital reference services.

Using content analysis and discourse analysis, Ford (2003), in her doctoral dissertation, assessed the difference between face-to-face (FTF) library reference interactions and computer-mediated communication (CMC) reference interactions (e-mail and chat). The service was affiliated with a large University library in the U.S. serving over 20,000 students and used HumanClick delivery technology. For a period of three weeks during the year 2000, 12 librarians were observed while providing all three types of reference interactions. "Runaway patrons" (users ringing the service but leaving before interacting with a librarian), were discarded. With three broad categories (directional, substantive, and other) the researcher using another coder checked reliability of the coding scheme. Initial inter-rater reliability was 0.70 for the coding scheme. Statistical difference across all media was obtained using Chi square.

Ford (2003) studied a total of 341 reference interactions: 114 (33.4%) FTF reference; 125 (36.7%) e-mail reference; and 102 (29.9%) chat digital reference. Although findings showed similarities across all media, FTF users tended to ask more substantive questions [383 (61.18%) with 636 as the total number of questions; 224 (72.73%) chat with 308 as the total number of questions; and 147 (61.76%) e-mail with 238 as the total number of questions].[8] FTF librarians used a wide variety of resources, collaboratively, and had a higher number of the back-and forth exchanges during interactions. Moreover, chat digital reference and e-mail reference services had more commonality in instruction than with FTF reference services. E-mail and chat interactions were more time consuming, had fewer words exchanged, but showed more balance between participants interacting than between participants interacting in FTF interactions. Chat librarians offered much less instruction than FTF librarians. Compared to CMC librarians, FTF librarians involved users in greater numbers of interactions and instruction and more often verified information received from users and confirmed their understanding of what librarians were

[8] *Substantive* is a category used in Lynch's (1977) dissertation. A variety of types of questions were classed in this category: library holdings, research questions, factual questions, evaluation and interpretation, and questions about the digital reference technology.

trying to communicate. Also, compared to FTF users, chat and e-mail users were less likely to ask for interpretation or explanation of sources or to ask for instruction (Ford 2003, 282). In interview data, a librarian stated that instruction should be emphasized in digital reference because it involves the user in the reference process. Regarding electronic media, another librarian commented that it was easier to send an URL via chat than e-mail (Ford 2003, 288). Librarians preferred FTF to e-mail or chat for question-negotiation. When considering the types of questions received, several librarians commented that the nature of the networked environment presented technological changes impacting the types of questions received. Considering this, Ford noted that the newness of chat might have affected the study considering the number of questions from librarians inquiring about the chat service itself. For example, she noted that the chat icon was most prominently placed on the host library's Web page, while the email link was somewhat hidden. The hours of operation and the specific academic period may have affected the number and types of questions asked as well.

Unobtrusive Testing.

One of the first unobtrusive tests of reference services was conducted by Crowley in 1971, which was replicated by Childer in 1971 (Benham 1995). Unobtrusive testing was widely used during the mid-1980s to assess the accuracy of reference librarians' responses, and recently, was employed in the study of digital reference services. Unobtrusive testing involved using proxy users, people role playing as users to ask reference questions of reference staff without their knowledge. The method uses predetermined questions and corresponding answers to evaluate accuracy in reference services (Hernon and McClure 1986). A criticism of this approach is that it uses proxies to ask librarians questions. Other criticisms include: all reference staff are not tested; there are ethical concerns; and there is a lack of consideration of local or unique contexts (Hernon and McClure 1987).

White, Abels, and Kaske (2003) conducted a pilot study of a chat digital reference service using unobtrusive testing to evaluate the quality of the service using proxy users. Researchers examined the accuracy and completeness of answers, and found that 75% of questions were answered accurately. However, sometimes librarians guided users to the appropriate Web site and left them to find their own answer. An average chat digital reference transaction was seven minutes. Answers usually consisted of referrals to one or more Web sites but rarely did information specialists comment on their reasons for selecting a particular Web site. To assess

the quality of the experience, chat session logs were reviewed for accuracy of the answer, the focus or the main objectives during chat, and various librarian traits (e.g., patience, helpfulness, and undauntedness). It was difficult for researchers to measure system down time, user frustration (e.g., when using suggested sources), long queue times, lag time (e.g., when acknowledging responses), and technical problems. The authors suggested the need for better measures to evaluate the quality of both positive and negative experiences of a chat digital reference session.

Nilsen (2004) and Ward (2003) conducted two interesting studies using unobtrusive testing to study digital reference services. Both studies use RUSA's (1996) behavioral guidelines as criteria to assess the reference interview in digital reference services. In addition, Ward's study describes how digital reference transcripts can also be used as tools to teach students and librarians appropriate reference interview skills. It should be noted that RUSA's (1996) guidelines are currently undergoing revisions to include the digital reference context, particularly chat digital reference (Ronan 2003b). It is useful to provide an overview of these guidelines prior to discussing studies that apply them. It is interesting to note that the following guidelines have been adapted to the digital reference context, particularly chat digital reference. The behaviors for *searching* and *follow-up* remain basically unchanged from the 1996 guidelines. However, *formality and pacing* appear to be new behaviors, which are not listed in the original guidelines.

Initially, RUSA's (1996) behavioral guidelines were established to assess librarians' performance during the reference interview in traditional reference services. Dimensions comprising the guidelines include *approachability*, *interest*, *listening*, *searching*, and *follow-up*. Many of these behaviors involve using audio and visual cues, which are generally lacking in the digital reference context. RUSA's proposed guidelines as adapted to the digital reference context include:

- *Approachability* is intended to build rapport with the user. In the digital reference context, this behavior pertains to various features of the service itself as well as to the librarian. Examples include: having an attractive interface with easy logon mechanisms; having prominent visible links to the service's Web site; providing timely feedback to users; sending initial greeting such as *welcome*; working the user's name into the conversation; and telling the user your name as a means of revealing oneself.

- *Interest* is demonstrated by indicating that you care about the user and his or her question. That is, the dialogue with the user should indicate that you are thinking about their question (e.g., what an interesting topic).
- *Formality* and *Pacing* are intended to aid the librarian in adjusting her or his actions and responses to the user. This includes emulating aspects of the user's behavior. For example, only use emoticons and abbreviations if used by the user; and if the user's typing responses are slow the librarian's typing responses also should be slow in order not to overtype the user.
- *Listening* and *Inquiring* are used to clarify the reference interview. This entails using techniques such as open and closed questions, paraphrasing, and remaining objective about subjective matters or the nature of the question.
- *Searching* is intended to aid in developing and executing the search. This entails devising a search strategy; consulting appropriate databases and other resources; and instructing the user.
- *Follow-up* is intended as a recourse to correct deficiencies in the reference process. The librarian tries to determine whether s/he has answered the question correctly and tries to encourage the user to return to the service. The librarian does this by asking the user *have I fully answered your question*; referring user to other librarians, resources, and services when appropriate; and telling the user to please contact them if s/he has further questions.

In a study using RUSA's (1996) behavioral guidelines and unobtrusive testing, Nilsen (2004) reports on users' perceptions of reference services received in e-mail or chat transactions in comparison with face-to-face transactions. This study (Phase III) is compared to earlier studies (Phase I and II). Phases I and II entail users' perceptions of their *experiences* with traditional reference services, while phase III of this study entails users' perceptions of digital reference services.

The unobtrusive tests used in phases I and II are the basis on which phase III of this study is conducted. In this study, forty-two Canadian LIS students served as proxy users. During February and May 2003, students were required to approach a digital reference service with a question and were required to maintain a detailed log, reflect on their experiences by summarizing them, and to complete a questionnaire pertaining to these experiences. Librarians at

the reference service were unaware that students were participating in a research project. Students were also asked "Given the nature of this interaction, if you had the option, would you return to this digital reference site again with another question?" (para 20). The study did not consider types of questions asked or how correct the answers were.

Results from phase III were compared with results from phase I and II. The study found that 62% of students were *willing to return* to the service as compared to an average of a 64% return rate for students in phases I and II. Follow-up questions were lacking for 36% of students participating in traditional reference services compared to 30% for students in digital reference services. In general, the reference interview occurred for 49% of users during their traditional reference encounter and for only 20% of users during their digital reference encounter. Based on these results, Nilsen suggests that there is a difference in the general reference interview between traditional and digital reference. However, it seems that such a comparative study would use at least a t-test or an analysis of variance to determine differences in the groups.

Ward (2003) used unobtrusive testing and RUSA's behavioral guidelines to identify and analyze the presence of effective reference interview skills in chat session transcripts. Ward used 11 graduate assistants to assess reference interviews reflected in 100-120 chat transcripts. Graduate assistants were required to select transcripts that had a thorough reference interview, and they were required to exclude transcripts pertaining to directional transactions. Graduate assistants were familiar with RUSA's guidelines from their course work and from their library training. Assistants were required to complete pre- and post-self-assessment checklists. The pre-assessment did not include behaviors from RUSA's guidelines, while the post-assessment did. Because a*pproachability* and *interest* pertained to body language, the author used *perceived warmth* to represent these behaviors. This included using emoticons and making comments such as "That's an interesting question." Other behaviors included *listening*, represented by open and closed questions and paraphrasing; *searching*; and *follow-up*. Assistants also wrote pre- and post-assessment essays in order to describe the purpose and structure of the reference interview and to describe key techniques that could be applied to their work. These assessments were intended to help students recognize the important parts of a reference interview and their impacts, as opposed to grading individual chat encounters (p. 50). Reference staff was unaware that their work was being analyzed.

By comparing pre- and post-assessments, Ward (2003) reports the following results: a change in knowledge for five out of eleven students in identifying different stages of the reference process; five out of eleven students improved in identifying open questions in reference interviews; and two students worsened in being able to determine when to and when not to paraphrase in identifying appropriate sources, and in knowing appropriate follow-up questions to ask. Post assessment essays indicated that graduate assistants were interested in applying to their work or wanted to know more about paraphrasing and open questions. Few students commented on the "perceived warmth" category in the pre-assessment essay. However, comments from post-assessment essays indicate that students felt that sufficient interest and warmth were displayed for interviews (84 out of 98 transcripts). Also fewer than 47 of the 98 transcripts used the reference interview. Further, self-assessments indicated that less than 47% of search strategies were explained to users; and approximately 55% of librarians kept users updated on searches. Graduate assistants indicated that the amount of library instruction provided was low (p. 53). Assistants also commented that they needed to learn more about the search process. Nine out of eleven graduate assistants felt that they understood what follow-up questions were appropriate to ask. Ward believes that chat transcripts are viable tools to aid in training staff in reference interview skills. By choosing their own transcripts to analyze Ward believes that "students got a chance to make an evaluative decision on each question about whether an interview was appropriate, and they got to learn from the lack of standard interviewing techniques as much as from the presence of them" (p. 54).

In general, evaluation is a fuzzy area, requiring much flexibility. There is overlap among various approaches (e.g., objective-oriented, systems-oriented, and outcomes assessment). Although outcomes assessments currently appear to be of high interest to the library community, there is no one approach to evaluation that captures all of the dimensions of a service. As a result, many propose the use of multiple methods, both qualitative and quantitative, in evaluation (Patton 2002; Rossi, Freeman, and Lipsey 1999; Van House, Weil, and McClure 1990; Worthen, Sanders, and Fitzpatrick 1997).

CHAPTER 4

METHODOLOGY

This research seeks to understand users as they interact with librarians in a chat digital reference environment incorporating collaborative tools. These users communicate in a text driven environment, which depicts various elements of human experience during information seeking. As a qualitative perspective emphasizing the meaning of text, hermeneutics tied to the cognitive view of library and information science (LIS) provides a lens for exploring those experiences.

Qualitative research is conducted in a naturalistic environment and focuses attention on real world situations such as digital reference services as they naturally emerge. As an emergent design, qualitative research is flexible, responsive to new discoveries, and is concerned with multiple perspectives. Qualitative research collects rich data via document analysis, interview, observation, and related means. It provides in-depth understanding of people such as digital reference users, their perspectives, and their experiences in unique settings. To get at the depth of meaning in a qualitative design, several philosophical perspectives are possible, one of which is hermeneutics (Patton 2002).

Hermeneutics is a philosophical perspective concerning interpretation or meaning of text. Text, as a cultural object, links hermeneutics to human science in which language and physical and mental related activities are cultural expressions of human beings. Allen Lee, a major proponent of hermeneutics in the area of Management Information Science, further states, "the interpretative understanding is how an observing researcher (for instance, an anthropologist or an organization scientist) understands these human [beings] to understand themselves and the world around them" (Lee 1994,147). He indicates that the observing researcher can develop understanding through a variety of ways, including the interpretation of human textual artifacts. Language in text represents the socially constructed world of the individual authors of the text, according to Lee, who draws on Ricoeur's emphasis of text and Heidegger as well as Gadamer's emphasis of the prior knowledge or pre-understanding of textual interpretation. That is, text is comprised of expressions and language produced by its authors to convey meaning. These

authors generally use words and expressions representing the world from which they are a part of at a given point and place in time to depict their lifeworld. Further, it is possible through vicarious activities such as reading that interpreters, such as researchers, can immerse themselves into the world of authors of the text and derive its meaning. Thus, through immersion the researcher embeds herself into the world of those represented in the text to derive an understanding closely aligned with authors of the text. That is, the researcher can understand text from the perspective of its producers, the authors of the text, and can derive new meaning from the meaning intended by authors of the text. Such new meaning is possible, according to Lee, because as an interpreter of text, the researcher brings prior knowledge or pre-understanding from his or her work experiences, education, affiliation, and related background, which influences how s/he interprets text. It is through the interpreter's awareness of his or her pre-understanding that s/he can gain access to the meaning in text. The pre-understanding of the interpreter also influences how s/he interprets the text. As a result, interpretation of text also requires that the interpreter is aware of his or her pre-understanding to depict the author's view as accurately as possible when interpreting text.

Through hermeneutics, according to Dooley and Keen (2001) meaning is derived from textual interpretation that is based on language, which reflects the thinking, feelings, and actions of human beings. In LIS typically these human dimensions are used to understand users and their needs, and studies of users in this context are sometimes referred to as the cognitive perspective of LIS. Because such human dimensions are also depicted in digital text remaining from users interacting in digital reference services, it is possible that much can be learned about the experiences of users from these digital artifacts. It is therefore reasonable to assume that hermeneutics linked to the cognitive perspective of LIS is an appropriate philosophical perspective to guide a study to understand the experiences of digital reference users as reflected in digital text. It is also reasonable to assume that content analysis, a method used for interpreting text, is the appropriate method for understanding the experiences of users interacting in a collaborative digital reference environment. This method is further discussed in Phase III of the dissertation.

Assumptions

An assumption of this investigation is that digital reference users are real persons seeking information in a naturalistic environment in virtual space. These users are connected to other real persons who are all working on real computers connected to real networks; it is, therefore appropriate to consider the working environment, Web space, for such users as real. Thus, Web space for digital reference services such as chat represents a natural world for users and librarians working in such a setting.

The presentation of the user's question and the librarian's attempt to answer that question is a principle of library reference services from the physical world that is carried over to the digital world. Digital users seek information in the world of cyberspace, where they leave traces of their activities as data on server transaction logs. These logs capture and store data from digital transactions, which can be retrieved in the form of digital text, the transcript. As a product of digital reference interactions, the transcript depicts human thoughts, feelings, actions, and related activities occurring during these interactions, and it represents the information seeking world within which users interact. Moreover, transcripts preserve the language of users and provide an unobtrusive lens for observing and understanding user experiences during their collaborative chat digital reference encounters.

A further assumption is that the researcher, as an instrument in qualitative research who brings pre-understanding from previous experiences, influences how transcripts are interpreted. For example, the researcher's work experience as a traditional reference librarian; a member of the *Quality in Digital Reference* study team; and as an advisee of a dissertation committee having expertise in CMC, reference, information retrieval, and bibliographic instruction, contributes toward how the researcher interprets the transcripts. However, to most accurately present the original intent of producers or authors of transcripts, the researcher is reflexive in reading transcripts and immerses herself into the world of those reflected in these texts. By doing so, it is possible for the researcher to depict the meaning of producers of the transcripts, as well as for her to be aware of and note new insights in assigning meaning to transcript data.

A final assumption is that hearing from the users will enhance the meanings derived from transcripts. It is further assumed that users, whether reflected in chat digital reference or interview transcripts, are truthful regarding their digital reference experiences. An understanding

of digital reference users can then be used to inform service design and thus, improve librarian and user interactions during information seeking in the digital realm.

Transcripts

In a chat digital reference environment, communication takes place through a text-based medium. Communication is rapid, lacks visual and audio cues, and is through informal language. This gives chat the appearance of being chaotic and fragmented (Herring 1999) causing dialogue between users and librarians to overlap and take place out of sequence, thus disrupting turn taking. Such communication has resulted in participants devising strategies such as using abbreviations/emoticons and non-standard spellings to maintain coherence (Herring 1999; Werry 1996), perhaps to compensate for the lack of non-verbal cues.

As previously indicated, in chat digital reference, communication between users and librarians is captured and stored in computer server logs, which are retrieved as transcripts. This, thus, renders communication reflected in chat transcripts as authentic without any influences on participants by the researcher.

Further, chat transcripts not only depict the linguistic communications of users and librarians in the chat digital reference environment, they also depict contextual information such as time of the interaction, purpose of the interaction, and status of the information seeker. This information is possible because the chat digital reference service requires users to register prior to their connecting to the service. User connection to and disconnection from the service makes it possible to derive information about the session length, which provides begin and end times for the chat digital reference session. Other contextual information that is captured in transcripts includes the date of the session, status of the user (e.g., undergraduate, not affiliate, staff, faculty, and the like), referral (page from which the user accessed the service), user and librarian IP addresses, and related data. Further, personal information such as e-mail addresses, personal names, institutional affiliation, and other identifying information are captured by computer server logs and are represented in transcripts if the server is not programmed to remove or replace such information.

Considering the richness of chat transcripts, it is possible for the researcher to observe and derive an understanding of users' interactions in a digital reference environment

incorporating collaborative tools. Also, through reading these transcripts, it is possible for the researcher to immerse herself in the world of digital reference users to see, observe, and understand that world from the perspective of participants represented in chat transcripts, as well as for the researcher to derive new understanding from these perspectives.

Participants

In this study, students are the predominant user group using a chat digital reference service affiliated with a university library in the western region of the U.S. These students are selected as the unit of analysis for the interview phase of this study. Of particular interest are students who have participated in one or more reference encounters during the period of September 2002 and May 2004 at the host university's digital reference service incorporating collaborative tools. As users of the chat digital reference sessions, these students are represented also in the transcripts. Undergraduate, graduate, writing, and medical students are the subcategories of students represented in chat transcripts for this study. Accordingly, it is from this group that interviewees were selected to gain more in-depth understanding of users' collaborative digital reference experience.

Data Collection and Procedures

This research was conducted in four phases. Phase I, II, and III were unobtrusive. Phase I of the study consisted of document analysis to obtain background information about the chat digital reference service. These documents include a review of the host library's Web site, a review of the host library's digital reference procedural guidelines, statistical reports, and related documents about the digital reference service and the host library. Phase II consisted of sample preparation and isolation. Phase III entailed an analysis of 10% of chat digital reference transcripts in order to develop a coding scheme. This scheme was used to analyze transcripts remaining following pilot testing. Phase IV of the study entailed conducting standardized opened-ended interviews of three digital reference users who have participated in co-browsing/escorting, Web page pushing, and related activities during their visit to the chat digital reference service.

Phase I: The Setting

This study seeks to understand the experiences of digital reference users participating in co-browsing/escorting and Web page pushing activities during the information seeking process. Such collaborative activities are captured and stored by the computer system, are reflected in the digital reference transaction logs, and are retrieved as chat transcripts for this analysis. The digital environment is the site (i.e., context or setting) in which these activities occur. The setting or the natural environment within which users and librarians interact to produce this study's digital reference transcripts is described in terms of its socio-demography, delivery software, service policy, and the dynamics of interactions. Information about the setting is derived primarily from analyzing documents produced by the host library, particularly documents pertaining to the chat digital reference Web site and its computer transcripts from the digital reference service. Other information about the setting is obtained from an informant, who is head of reference services at the host library. This informant has assisted the researcher in gaining access to the host library's transcripts and in obtaining various resources about the chat digital reference service. The informant also has provided the researcher a demonstration of the co-browsing/escorting and Web page pushing features incorporated in this chat digital reference technology.

Socio-Demographic.

The site for this case study is a digital reference service affiliated with a university library located in the Western region of the U.S. The university is the parent organization for this digital reference service; its student population consists of approximately 20,000 undergraduate, graduate, and professional students. The library's service provides face-to-face, phone, e-mail, and chat digital reference services. It has formally provided chat digital reference, the focus of this study, since September 2002. Staffing for the service consists of twenty professional librarians and one paraprofessional staff. Library statistics indicate that the chat digital reference service averaged approximately 85 questions per month from July 2002 through June 2003 and increased slightly to 99 questions per month from July 2003 to June 2004.

Service Access Point.

The researcher visited the Web site of the host library, including connecting to the chat digital reference service in order to better understand some of the experiences of users who have accessed the service. Observations from this experience indicate that the primary access point to

the online reference services is the host library's home page. The home page contains the names of the host library and the affiliated university at the top with a search box to its far right corner. The home page is attractive, well organized, and contains links to a variety of resources and services. These resources and services include the *Ask a librarian* information service, the online catalogs, subject guides, online full-text resources, search engines, a site map, links back to the home page, and contact information for the Web manager. A link back to the Library's home page is located at the bottom of all of the site's pages.

Clicking on the *Ask a Librarian* hyperlink on the library's home page connects the user to a Web page containing links to the various library reference services: chat, email, telephone, in-person. This Web page also includes information about various university libraries, including their phone numbers. At the top of the *Ask a Librarian* page are links to *Guidelines* and *Privacy Statements* pertaining to reference transactions. Below the guidelines and privacy statements are links to the chat digital reference service, including recommended browsers for accessing the service. Also on the *Ask a Librarian* Web page beneath the *Ask a Librarian Live* (the chat digital reference service) link are the hours of operation for the service.

Clicking on the *Ask a Librarian Live* hyperlink takes the user to the chat digital reference service Web page, which is divided into two frames. The left larger frame contains a list of *frequently asked questions*, while the right smaller frame contains the heading *Ask a Librarian Live.* Below the *Ask a Librarian Live* heading in the right frame are four horizontally stacked text boxes labeled as follows:

1. *User name* - requires users to input their names.
2. *E-mail address* – requires users to input their e-mail address.
3. *Status* box - allows users to select options from a drop-down menu. Options include writing student, univ faculty, univ staff, univ graduate, medical resident, univ undergraduate, and not affiliated.[9]
4. *Question* – allows users to input their statement of need or question and to type other messages pertaining to their chat interaction.

Buttons are beneath the *question* box in the far right and left corners, respectively, allowing users to *connect* to and *exit* from the chat digital reference service. When the user

[9] To keep from disclosing the name of the university and the host library, selection options were modified e.g., using *univ* instead of the abbreviation for the university.

connects to the service via the *connect* button, s/he sees the two frames previously described. These frames are seen throughout the chat digital reference interaction. Furthermore, the *question* box in the right frame becomes the area where the user types messages throughout the interaction. Interestingly, the left frame, where hyperlinks to library resources and services are seen, is where new Web pages open up on the user's desktop during co-browsing/escorting. The left frame is also where databases, the OPAC, renewal and interlibrary loan (ILL) forms display with their *search* boxes, which allow users and librarians to see text as it is being typed when co-browsing/escorting features are enabled.

Delivery Software.

The research informant and procedural guidelines provided the researcher with information about the delivery software, 24/7, which is developed by e-Gains and enhanced by Metropolitan California Library Services. The 24/7 software is capable of receiving questions and sending answers, compiling statistics, administering pop-up surveys, and a number of other functions. The software also allows user and librarian to send and receive Web pages, including co-browsing/escorting. Communication between user and librarian is primarily via a text-based chat medium.

The procedural guidelines for the chat digital reference service indicate that when a user inputs the requested information into the various text boxes in the right frame and connects to the service, the 24/7 software holds the user in queue in the order in which s/he arrives to the queue. Clicking on *connect* causes two things to occur: 1) an icon on the librarian's computer turns blue, flashes, and makes a bell-like sound (if preferences are set for sound); and 2) users are held in a queue where they remain until the librarian selects them for a session. While users are in the queue, librarians cannot see their questions until they are selected for a session. When a user is selected from the queue and is placed in a session, the librarian is able to leave the user in the session alone while s/he leaves the session to select and place another user in a separate session. Thus, librarians are able to work with multiple users, which is possible only after the first user is selected from the queue for a session. Although librarians are able to work simultaneously with users in multiple ongoing sessions, the service guidelines recommend that librarians assist no more than three users at a time.

When the 24/7 co-browsing/escorting features are turned-on, it allows both user and librarian to view the same Web page from their respective desktops. However, librarians are

only able to co-browse/escort from the librarian console while working within the same session as the user. Co-browsing/escorting features display Web pages on both participants' desktops when one of two actions occur:

- The librarian console is turned-on and the librarian sends the URL via the Web address bar.
- Either user or librarian clicks on a link in a currently open Web page, typically causing the new Web page to automatically open on both participants' desktops.

Clicking on hyperlinks in Web pages allows both participants to view the same Web pages jointly as they proceed through the chat digital reference session. Conversely, when co-browsing/escorting features are off, users are unable to see Web pages clicked on by the librarian or vice versa. In addition, the informant and the procedural guidelines indicate that by working within the librarian console, it is possible for librarians to work with users in multiple sessions as well as watch what each user is doing while s/he is not in the session with the user. That is, when the librarian is not in the same session as the user, s/he is unable to see the full Web page clicked on by users but is only able to see the labels *page sent* or *item sent* preceding the title of the resource or service that the user clicked on. Also, the researcher has observed in transcripts that while some users are in sessions alone, they sometimes click on Web pages. These Web pages appear in transcripts as *page sent* or *item sent* labels preceding URLs, indicating that these labels are not always indicators of co-browsing/escorting features. The informant for this study confirms this finding. This particular user behavior has implications for this research and is further discussed in the *Sample Isolation and Preparation* section of the Methodology of the dissertation.

Service Policies.

Ask a Librarian reference service posts policies pertaining to both the chat digital reference service as well as the library in general. Policies are posted for service operation hours, guidelines, and privacy.

The chat digital reference service indicates that it operates during regular library hours, excluding summers and weekends. Service hours are from 11:00 a.m. to 6:00 p.m. Monday through Thursday and from 11:00 a.m. to 3:00 p.m. on Friday.

Service guidelines state that university students, faculty, and staff are the primary clientele and that the service answers questions from non-affiliates pertaining to the university,

library collection, and related resources. The guidelines indicate that non-affiliates are sometimes referred to other libraries and resources outside the university.

The *Privacy Statement* indicates that the library is in accordance with the *American Library Association Code of Ethics* concerning the rights of users' privacy. The *Statement* informs users that limited personal data are collected and stored to clarify and answer their questions and collected to use for statistical and use analysis in order to improve the digital reference service.

Dynamics of the Interaction.

This concerns social interactions of the digital reference encounter as the researcher has observed in transcripts. Although the user question typically appears at the beginning of the chat transcript followed by two computer scripts, the actual interaction generally does not begin until the librarian enters the digital reference session and begins the dialogue. Thus, the opening of the actual chat digital reference interaction is initiated by the librarian, while the closing of the interaction is generally user-driven. Thus, the interaction generally begins with the librarian extending warm and friendly greetings to the user and generally closes with the user expressing appreciation and saying goodbye to the librarian. In some instances, users disconnect from the service prior to completing their chat digital reference interaction. Such user disconnections appear to leave the librarian uncertain about the status of the interaction (McGraw, Heiland, Harris 2003; Foley 2002; Gross et al. 2001). Interestingly, during some interactions, the librarian continues the dialogue even after the user has disconnected from the session.

In chat digital reference, transcripts indicate that users and librarians' social interactions are generally informal. Their communications are fragmented, typically overlapping one another and do not have the visual and audio cues found in face-to-face communication. However, users and librarians have employed various linguistic cues to compensate for the constraints of online communications. For example, they typically communicate with informal language, occasionally using slang, altered words, graphical symbols, and abbreviations to express thoughts and emotions. While online reference interactions vary in length, the pilot study used to obtain information about the setting, indicates that on average interactions last approximately 21 minute.[10]

[10] Note this average session length was derived from the pilot study of transcripts and differs from the average session length represented in the analysis for the remaining transcripts in the study, a median value.

Major concepts from the cognitive perspective of library and information science are represented throughout chat digital reference transcripts (for example, concepts such as cognitive, affective, and actional/contextual). These concepts represent the experiences of users engaged in interactions with a chat digital reference service employing collaborative tools, the primary focus of this study. These cognitive perspective categories have been derived from Kuhlthau (1991) (affective states), Wilson (1981) (barriers derived from information needs), and White (1983) and Ingwersen (1996, 1992) (cognitive). Examples of these categories and how they are reflected in chat digital reference transcripts are described in the following section.[11]

Phase II: Samples

"Purposeful sampling is a sampling technique used in qualitative study for the selection of information-rich cases whose study will illuminate the questions under study" (Patton 2002, 230). Such a sampling strategy highlights the difference between qualitative and quantitative designs. A qualitative design generally focuses on in-depth analysis, and generally includes a small sample. According to Patton, the sample may be a single case (N=1), selected purposefully. Conversely, quantitative design typically aims to generalize to large populations and requires a large sample, selected randomly, and is statistically representative of the sample's population. What would be *bias* in random sampling, and thus a weakness, becomes intended focus in purposeful sampling, thus its strength.

Two samples are used in this study: 1) transcripts from chat digital reference sessions and 2) interview participants. The development of the digital reference service is considered in the selection of these samples because service maturity is considered important for the integrity of data. 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. Thus, samples for this study come from an academic library in the western region of the U.S. This library has had many years of experience providing e-mail digital reference services and has provided chat digital reference services since September 2002. Moreover, the library's chat digital reference service employs collaborative features such as co-browsing/escorting and Web page pushing. Considering the recent rise in chat digital reference services and the long history of this academic library in

[11] In the coding scheme the researcher does not list each one of the cognitive perspective concepts or subcategorize concepts under them because the coding scheme would appear too lengthy and too redundant. Instead, the list of major categories enclosed in parenthesis represent specific cognitive perspective concepts (affective, cognitive, actional) i.e., as they pertained to the user.

providing digital reference, this academic library has provided the researcher a rather rich environment to conduct this study. In this research, criterion sampling strategies, sampling based on some set criteria, are used to purposefully select information rich cases. The logic of criterion sampling is to review and study all cases that meet some predetermined criterion characteristic (Patton 2002).

Transcript Isolation and Preparation.

Four criteria are used to select chat transcripts for the study; each transcript must include:

1. At least one *page sent* or *item sent* label preceding the URL. These transcripts, although not always, indicate the use of co-browsing/escorting features.
2. Interactions whose purpose is something other than software testing or staff training.
3. A *student* as the information seeker.
4. Dialogue between user and librarian, excluding the user question (information need), in which interactions extend beyond *yes*, *no*, *thanks*, *ok*, and the like.

Isolating transcripts utilizes Microsoft (MS) Word's *search, find, cut, and paste* features to select the sample meeting the research criteria. This isoation process is iterative, resulting in various transcript discards, until the desired sample is selected.

Two batches of chat transcripts, in the form of Excel files, from September 2002 to May 2004 were obtained from a University Library. In May 2004, the first batch was sent as an e-mail attachment from the host library for the period September 2002 to December 2002. In July 2004, the second batch was downloaded from the host library's Web site for the periods January 2003 to May 2004. These two batches yield approximately 1,600 transcripts. From these, 1,158 transcripts containing URLs in the body of the text were extracted using the *find, copy,* and *paste* functions of MS Word (for example, ***find*** *http*).[12] Collaborative features such as co-browsing/escorting and Web page pushing were included in this pool of transcripts.

Upon further review of the 1,158 transcript isolates, two types of URLs were seen in the body of transcript texts: 1) transcripts containing URLs preceded by *page sent* and *item sent* labels; and 2) transcripts containing URLs without *page sent* and *item sent* labels preceding the URLs. Some transcripts containing *page sent* and *item sent* labels include librarians' dialogue about implementing co-browsing/escorting features; therefore, these transcripts were isolated

[12] During the conversion of transcripts from Excel to text files, some transcripts were lost or deleted because the researcher had inserted numerous comments into files during extraction, which caused frequent freezing and shutting-down of her computer.

because they were indicators of sessions containing co-browsing/escorting. Nine hundred thirty-nine (939) transcripts containing *page sent* and *item sent* were derived from this iterative isolation. Therefore, this group of isolates meets sampling criterion one, which is to obtain transcripts indicating the use of collaborative features.

When the 939 transcript isolates containing the *page sent* and *item sent* labels were reviewed further, it was revealed that a number of interactions in these transcripts only concerned software testing and staff training. These transcripts were labeled as *univ test* in their *resolution category*, as *test* in the user question section, and/or as *test* in the librarian note section of transcripts.[13] The removal of *test* transcripts (326) met sampling criteria two, reducing the number of transcripts to 613 containing *page sent* and *item sent* labels.

Sampling criterion three was met by obtaining only those transcripts from the 613 isolates that included students as information seekers. Identifying and discarding transcripts with status categories for *not affiliated* (53), *univ staff* (70), and *faculty* (13) allowed this to be done. From the remaining set, transcripts were removed that contained: no status information (27), speaker names listed (for example, the speakers *user* and *librarian*) (12), no speakers listed above a message (5). This further reduced transcripts containing *page sent* and *item sent* labels preceding the URL to 433 transcripts with students as information seekers.

The fourth criterion was met by discarding transcripts with limited interactions (25) and no user-librarian interaction (61) from the remaining of 433 batch of transcripts containing students as information seekers. This final reduction yielded a total of 347 transcripts for the period of September 2002 to May 2004. It is this batch of transcripts that are used in the study. Due to the nature of chat digital reference, participants make many spelling, typographical, and other errors in transcripts. Such errors are retained *as is* in excerpts from transcripts included in the dissertation. Examples of each of these discards are provided in Appendix A.

In sum, transcript discards included those containing *not affiliated*, *faculty*, and *univ staff* as the status of the information seeker. Transcripts containing little or no interaction between user and librarian and *tests*, and those listing speaker names were removed. Other eliminations include transcripts without speakers or status information. That is, all of these were removed from the batch of transcripts extracted containing *page sent* and *item sent* preceding URLs. A

[13] *Resolution* is a category that the host library listed on transcripts, indicating how sessions ended (completed or loss) and indicating the type of service provided (reference, directional, referral, etc.).

new discard folder was made that included subfolders named for each type of discard that were stored after extraction. These folders are useful in that they allow for the determination of total transcript counts and allow for the identification of duplicates. After transcript extraction and discard, 347 transcripts remained. An additional five transcripts were removed because they were insufficient for the research, leaving a total of 342 transcripts as the sample for the study.

Cleansing transcripts involved removing personal names, e-mail addresses, institutional, and related identifying information remaining in the body of transcripts in order to protect the identity of the user as well as the host library for this study. Thus, all identifiable information was removed from the study sample. For example, sometimes the abbreviation for the university affiliated with the host library preceded the term *Librarian* in transcripts. These abbreviations were removed leaving only the word *librarian*. Other efforts to eliminate identifiable information in transcripts are as follows:

- Name of the university affiliated with the host library or other universities in the city or state as the host library were replaced by the term *university* or *univ*.[14]
- Name of the state where the digital reference service is located was replaced by the term *state*.
- Name of the library hosting the digital reference service, its branches or other affiliates was replaced with the term *library.*
- Name of the online catalog or related systems listed in transcripts was replaced with the term *OPAC* or *system name.*
- Name of the library, university, catalog, or other inclusions in URL addresses affiliated with the host library was replaced with *Lib, opac, univ,* and so forth.

This dissertation generally refers to persons seeking information as *information seeker* or *user*. For consistency in discussions to follow, the speaker *patron* is changed to *user*. Also, many transcripts include computer scripts that are not labeled. For coding purposes, these responses were labeled as the speaker *computer response*. However, scripts inserted in transcripts by librarians were coded under librarian as the speaker.

Formatting transcripts prepared them for import into Nvivo software and helped to facilitate analysis using this software. Nvivo requires data to be imported as text, preferably as a

[14] The researcher has replaced the names, abbreviations, or like for the host university in transcripts, including in URLs or e-mail addresses.

Rich text file to maintain original formatting. Also, transcript speaker names were formatted as MS Word heading levels (for example, Level 1, Level 2, Level 3, etc.) prior to converting to Rich text.[15]

Transcripts were first converted from Excel tables to text, which resulted in a compressed unformatted text document. Using the special features of *find/replace* in MS Word, the unformatted text was divided into speaker segments (user, librarian, and computer response) by inserting a space after the date/time label in transcripts.[16] Additionally, each speaker was globally formatted as a heading level using the advanced elements of the *find/replace* features of MS Word. Formatting transcript speakers as heading levels prior to importing into Nvivo allowed:

- Section coding, which allowed autocoding of speakers. Autocoding captured everything said by each speaker in the transcript into a single code, which was useful during searching for patterns in the data.[17]
- Coding segments to be more readily seen during coding.[18]

A new folder was made and named *formatted transcripts* to store transcripts until importing them into Nvivo software for coding and analysis.

Phase III: Content Analysis

Chat transcripts are used in this study to understand digital information seekers through the lens of hermeneutics yoked to the cognitive perspective of library and information science. In this study, content analysis is the method used to interpret chat transcripts, by applying these two philosophical perspectives. There are some advantages and disadvantages of using content analysis. According to Babbie (2001), the primary advantage of content analysis is that it is more economical and easier to repeat than survey, focus groups, or interview. Many of the categories used to analyze data are derived from the data itself. Content analysis is an unobtrusive method and does not affect users' behaviors as do obtrusive methods such as survey,

[15] Heading levels allowed for section coding in the coding software, which allowed for searches focusing on specific speakers or on what they said.
[16] MS Word had ***special*** and ***more*** features under ***find*** which enabled the global insertion of spaces at specified places in transcripts that are consistently labeled the same way throughout the document. In transcripts, the "**PT**" label following the time was seen at the end of each speaker message segment.
[17] The user, librarian, and computer response represent the coding segments for transcripts. Prior to section coding, the researcher only coded utterances of speakers and not the speakers themselves.
[18] Consistency throughout when formatting transcripts is important because inconsistent formatting may later affect software output during analysis of search results.

interview, and focus group. Further, as the method of choice for this study, content analysis provides an unobtrusive means of interpreting:

- the characteristics of users of digital reference services including their academic status and information need;
- the actions, thoughts, and feelings, as reflected in text, of persons participating in collaborative digital reference encounters;
- the interactions of study participants with the librarian and objects in the digital reference environment; and
- the barriers encountered by persons participating in the digital reference environment.

Some disadvantages of content analysis are that it is limited to recorded text; it can be immensely time consuming. Moreover, some may question whether it is ethical to observe and analyze individuals through texts without their knowledge or consent (Babbie 2001).

Coding Scheme.

A number of studies in content analysis require the design and implementation of a coding scheme. Such schemes include codes and definitions that are applied throughout the coding process (Weber 1990) and are the means by which measures are developed and applied to observe phenomena in text (Babbie 2001).

Codes are derived both deductively and inductively in developing the coding scheme. That is, codes are derived from the study's research questions, the cognitive perspective, the literature, and from the data itself. In general, the coding scheme serves as a source of categories and definitions that can be linked to relevant concepts, themes, and patterns in the data.

During the initial development of the coding scheme for the study, relevant concepts were derived from the study's research questions, literature review, and from the cognitive perspective and were input into the hierarchical tree structure of the Nvivo qualitative software (see figure 1 for an image of the tree structure). This resulted in deductively derived codes and categories such as: *co-browsing/escorting* and *URL pushing*, which were derived from the research questions; and *affective dimensions*, *barriers, initiation*, *termination*, and *information need*, derived from the cognitive perspective of LIS. Patton (2002) refers to such *a priori* codes as *sensitizing* concepts because they are what the researcher uses to focus the study, which indicates that research is not done in a vacuum. According to Miles and Huberman (1994),

developing codes within some framework such as the cognitive perspective enable the production of credible, dependable, and replicable terms.

Once sensitizing concepts were derived and incorporated into the tree structure of Nvivo qualitative software, 10% of chat transcripts (Krippendorff 1980) (approximately 35 of the 347 formatted transcripts) were imported into the coding software for pilot testing. The message or the speaker-segmented message of transcripts was used as the coding unit. Prior to coding, a reflective reading of the transcript was conducted looking for recurring themes and patterns. From these themes and patterns, a code was developed and incorporated into Nvivo's tree structure. Insights or reflective thinking pertaining to codes or the phenomenon were recorded into memos in the coding software, which were linked to the code or the transcript itself. Hence, the process of reading, memoing, and coding transcripts and incorporating newly emerged codes into the software's tree structure were repeated for each transcript. Eventually, the number of inductively derived codes emerging from the data decreased; and these codes, incorporated in the tree structure, were used to describe phenomena represented in transcripts. Operational definitions were devised for each code and included in the *properties* section in Nvivo for the respective code.

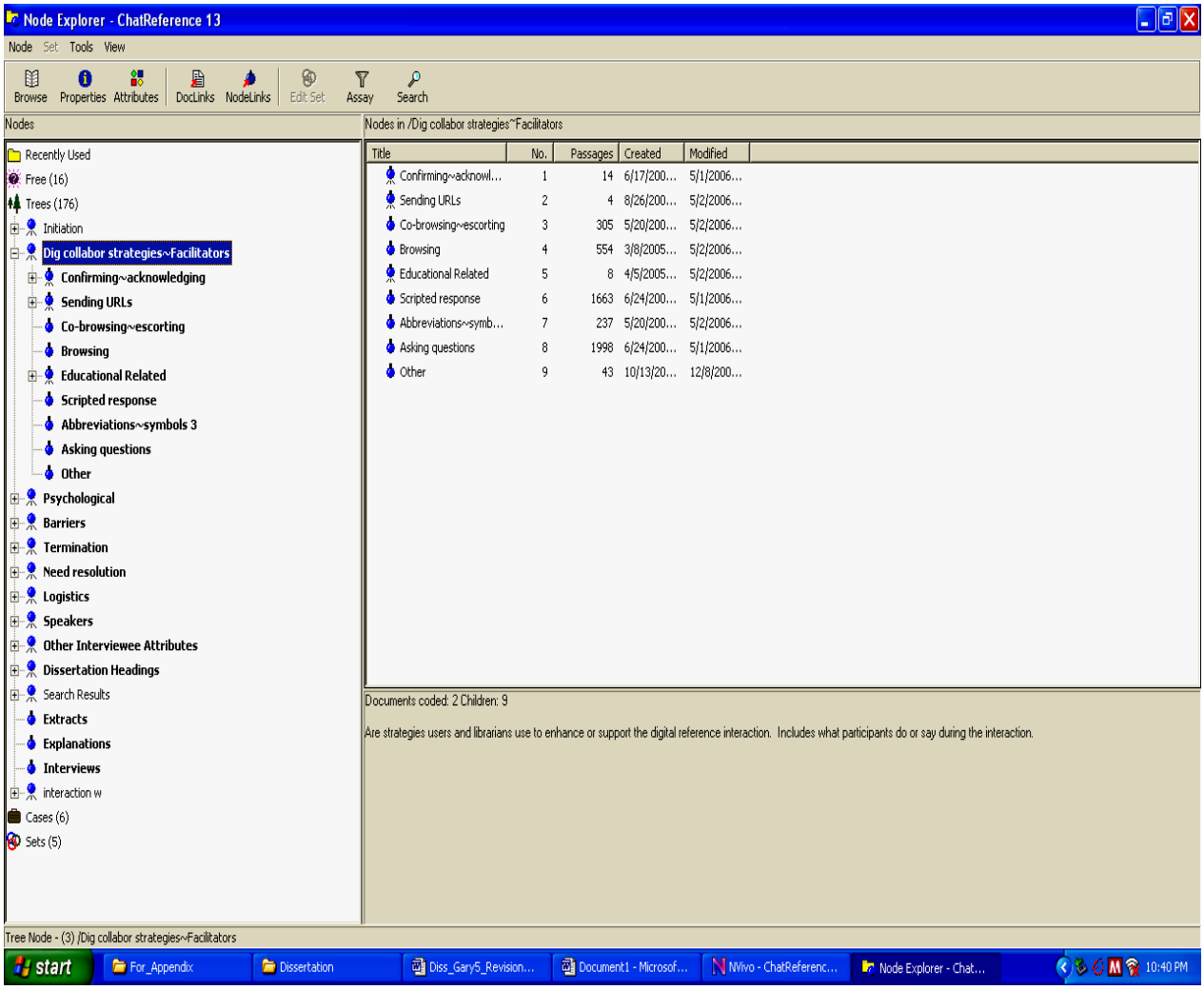

Figure 1: Image of the hierarchical tree structure for the Nvivo qualitative software representing the categories and codes for the coding scheme.

Finally, when coding the 10% pool of transcripts was complete, each category in the Nvivo's tree structure was reviewed and reorganized as parent, child, or standalone (non-parent and child) codes, resulting in codes arranged into a sort of hierarchical relationship of broad categories, subcategories, and codes not fitting either a broad category or a narrower subcategory. These hierarchical codes in the tree structure represent the coding scheme for the study (see Appendix B). The coding scheme was used to code the remainder of the data.

Validity and Reliability of the Coding Scheme.

During the coding process, the researcher was reflective, noting the meanings in transcripts, and making coding decisions best representing those meanings. When relevant, the coding scheme was revised to account for new concepts, themes, and categories as they emerged. The researcher kept a record and rationale for such decisions.

Quality of the coding scheme was assessed using triangulation and examples from the raw data itself. Triangulation establishes the validity criteria in qualitative research by examining the data from more than one vantage point, which may involve multiple data sources, investigators, theoretical perspectives, methods, or all of these (Patton 2002). For this study, software checks such as coding reports and searches of coded data, expert and peer reviewers, and excerpts from the data were used to validate the coding scheme.

Researcher's review of coding report

Nvivo software provides a number of useful tools to help with internal checks of the data. The software includes *memo, browse,* and *search* features to aid the researcher in checking and maintaining accuracy during coding. The software's memo and associated features are used to record reflective notes concerning codes, methods, documents and the like (see Appendix C). In many instances, these memos are linked to respective codes and documents, which can be reviewed further using Nvivio's browse features. The software's browse feature allows the researcher to select a code in the tree structure to review and check the accuracy of all texts linked to that code. Additionally, the researcher is able to prepare a coding report for each code to check the accuracy of coding. Texts were displayed at respective codes in browsing and coding reports, and these texts were reviewed for similarities and differences in coding. Differences in coding were further assessed to determine if these differences were due to some new meaning in the code, mistakes in coding, or due to something else. If the discrepancies in coding were due to new meaning in a code, that code was split into subcategories. For example, the code *demonstration* is initially one code in the tree structure but was split into two subcategories to account for it multiple meanings (*demonstration* with co-browsing/escorting features and without *co-browsing/escorting* features). When codes were split, texts coded at the original code were uncoded and recoded to the applicable subcategory.

When browsing codes or reviewing coding reports for different codes and seeing similarities in meanings at these different codes, the researcher merged such codes. For

example, during initial development of Nvivo's tree structure, codes for *information usefulness* and for *successes*, were included. Upon reviewing reports for texts with these codes, similarities were noted between the two; therefore, *information usefulness* was merged at *successes*. In another instances, *focused needs, semi-focused needs,* and *unfocused needs* were subcategories of *information need.* During coding, the distinction between *semi-focused*, and *unfocused*, and *focused needs* was sometimes questionable. To resolve such discrepancies, all of these subcategories were merged under the broad category *information need*.

Searching is another internal check of validity. Searching allows the researcher to produce a report, check for accuracy in coding, and follow leads. An example of this is seen with the *co-browsing/escorting* code. Initially, the researcher believed that text such as "*show you*" was the only indicator of *co-browsing/escorting.* However, during the coding process, phrases such as *take over your browser/computer*, *screen change* and related phrases, including a librarian script, emerged as indicators of *co-browsing-escorting.* A *search* conducted on these phrases confirmed that each of them represented a pattern in the data concerning *co-browsing/escorting.* In such instances, coding for this code was expanded to account for these new meanings.

Peer Review

Northey (1997) considers the peer review approach as confirmability of qualitative coding rather than as intercoder reliability, a quantitative measure used by some researchers to assess the quality of interpretative data and to assess consistency among team members coding data for the same project (Richards 2005). The external reviewer selected to conduct this analysis was able to complete only about 70% of the assessment. For the assessment, the reviewer was given copies of the coding report and the coding scheme and asked to check codes on the coding report against their definitions in the coding scheme (see coding report, Appendix G). Based on the reviewer's understanding of the codes' operational definitions, she was asked to rate passages in the coding report based on the following scale:

A. **Well supported by data** indicates that text segments are exemplary of codes that they are linked to.
B. **Satisfactorily supported by data** indicates that text segments sufficiently represent codes that they are linked to.

C. **Poorly supported by data** indicates that text segments are not very clear in reflecting codes that they are linked to.

Following the reviewer's rating of passages in the coding report, the researcher sought further discussions with the reviewer concerning her assignment of *poorly supported by data* ratings to some passages. However, the reviewer and researcher were unable to discuss this rating by the reviewer. The reviewer stated that she would be leaving town for several months and that she would complete the assessment upon her return. However, upon the reviewer's return home, the researcher asked the reviewer about completing the assessment, but the reviewer declined stating that she was unable to continue the assessment because of overwhelming commitments of her own. However, this study has many internal checks provided by the Nvivo software as well as the external checks provided by expert reviewers; the researcher does not believe that the lack of the peer review compromises the study in any way.

Expert reviewers

Members of the researcher's dissertation committee served as the expert reviewers. The researcher presented excerpts from coding reports and/or definitions for problematic codes to expert reviewers for their review and feedback. Feedback from expert reviewers typically resulted in either their agreeing with the existing coding; their suggesting the elimination of the code, or their helping the researcher to better clarify meaning, thus retaining the code in the tree structure.

Raw data

Full transcripts and excerpts from them are included in the dissertation to provide examples or to confirm various interpretations about the data. This approach, using excerpts or quotes from raw data, is typically used to support findings in qualitative research.

Application of the coding scheme.

The following section, *Application of the Coding Scheme*, describes the codes used in the coding scheme and includes examples of how those codes are used. Categories comprising the coding scheme provide insight into the cognitive, affective, and action/physical states of users interacting in the chat digital reference environment incorporating collaborative tools. Categories comprising the coding scheme are as follows: [19]

[19] Many of these categories have subcategories, which are not listed here. See A*pplication of the Coding Scheme* within the appendix section for a full list of codes and for examples of how they are applied.

- initiation - information need, opening greeting (cognitive, affective);
- need change (cognitive);
- digital collaborative strategies/facilitators – asking questions, confirming/acknowledging, scripted responses, sending URLs, co-browsing/escorting, browsing, educational related, abbreviations/emoticons (cognitive, actional/physical);
- psychological – RUSA behavior, affective dimensions (cognitive, affective);
- barriers – technology related, searching (affective, cognitive, physical/contextual)
- termination – normal closing, abnormal closing, evaporation (cognitive, actional/physical, affective).
- need resolution – resolved, referral, unresolved (physical/contextual); and
- logistics - begin time, end time (physical/contextual).[20]

The reader is referred to *Appendix D: Application of the Coding Scheme* for examples of how these codes were applied.

Phase IV: Standardized Open-Ended Interviews

An unobtrusive analysis of session transcripts may only provide a glimpse into users' perceptions and actions concerning their collaborative encounters during digital reference. To supplement this form of unobtrusive observation, standardized open-ended interviews were conducted with three participants from the host digital reference service in order to probe more deeply into what participants actually think and feel about their collaborative digital reference experience.

There are four advantages to standardized open-ended interviews. First, all interviewees answer the same questions, thereby increasing comparability of responses. Second, the data are complete for each interviewee on topics addressed. Further, this type of interview supports the organization and analysis of the data, yet data are flexible enough to allow the researcher the ability to probe further when necessary. Moreover, the interview guide permits interviewees to see and review the instrument used in the research (Patton 2002). Third, the interviewer him or herself is an advantage. That is, the interviewer can generally decrease the number of "I don't know" and "no answers" by clarifying matters (Babbie 2001).

[20] Although this concept does not have anything to do with the cognitive perspective concepts, it is coded in order to obtain the average session length count for interactions within the dissertation.

Some disadvantages of standardized open-ended interviews are that standardized wording of questions may constrain and limit the naturalness and relevance of questions and answers (Patton 2002). Interviews are sometimes perceived as obtrusive, which affect interviewees' responses (Babbie 2001). The application of the interview and other methods to a study of digital reference services is found in the data collection section of this dissertation.

The researcher has conducted individual interviews of three interviewees in a secure Internet chat room at Florida State University. Chat technology was selected as opposed to the telephone for conducting interviews for three reasons: One, chat is a more cost-effective way of communicating with remote users. Two, chat provides a text record of the interview. Three, chat allows participants to be interviewed within similar context as the digital reference context.

Participant Selection.

To recruit students, in October 2004, an announcement was placed on the host library's Web site briefly describing the study and asking those interested to contact the researcher (See Appendix E). When participants had not been obtained by December 2004, other recruitment approaches were applied, such as offering money, identifying and contacting student dormitories and listservs, and contacting university faculty, academic departments, and student organizations to solicit participants for the study. In addition, a second announcement was placed on the host library's Web site to recruit participants as seen in Appendix E.

When students contacted the researcher, a pre-screening questionnaire was used to obtain students meeting the following criteria:

- The volunteer must have participated in a Web page pushing and co-browsing/escorting activity.
- The volunteer must have had very satisfactory and/or very unsatisfactory collaborative (co-browsing) digital reference encounters.

Although the objective of the study was to obtain five participants for interviews, after over one year of recruiting only six persons responded to the announcements and of these six, only three followed through with the selection requirements and scheduling to participate in the study. However, due to the poor response to the recruitment announcement and the difficulty in obtaining participants for this study, the selection criteria were revised to eliminate the last criterion. Thus, participants were selected based on their having participated in a chat digital reference interactions including Web page pushing and co-browsing/escorting activities. Of the

three students selected to participate in this study, two students (one male and one female) were selected from volunteers responding to the recruitment announcement on the host library's Web site. The third student, a female, was a volunteer responding to the announcement posted to the writing listserv.[21] The pre-screening questionnaire was used to aid in the selection of participants for interviews. Based on students' responses to this questionnaire three students affiliated with the host library's university were selected to participate in interviews. All participants were asked to sign a consent form (see Appendix E).

An interview guide was used to focus the interview by ensuring that all participants were asked essentially the same questions. Additionally, questions on the guide were devised to help spark the memories of students concerning their collaborative chat digital reference experiences (see the interview guide in Appendix F).

Preceding the interviews, e-mail was used to communicate with each participant. Each interview was scheduled two weeks in advance. During the second week, prior to the interview, e-mail was sent to participants reminding them of the interview, which was scheduled to last about 60 minutes or less. The date and time of interviews were confirmed with interviewees through e-mail correspondence. Students were sent a copy of the consent form to read and sign prior to interviews.

On the day of each participant's interview, the researcher logged into the chat room at least ten minutes prior to the interview. Throughout interviews, the researcher made reflexive notes on a paper note pad (Patton 2002).

To protect the identities of students, the researcher uses pseudonyms rather than the real names of students. Anonymity was established by the administrator of the secure chat room at the researcher's university. The chat room administrator provided e-mail addresses for each participant to login and access the interview chat room. Participants were assigned the login names of *guest1, guest2,* and *guest3*, which appear in interview transcripts. In this dissertation, pseudonyms are changed as follows: Mary, Joe, and Linda, respectively, to both maintain participant anonymity and maintain the ease of reporting results and discussions. These names are used in the dissertation whenever findings from the interview are discussed.

[21] The content analysis portion of this study showed that a substantial number of students participating in the digital reference service were *writing* students. When recruitment became difficult, this *writing* listserv was discovered among the various resources (faculty, academic departments, student organizations, and others) at the host University. A message was posted to the listserv in order to increase the pool of interview participants.

Interview Guide.

A standardized open-ended interview guide was used, which, according to Patton (2002), allows the researcher to enter into the perspective of participants and capture the perception of their world. Such insights allow the researcher to understand participants' terminology, judgment, and complexities of experiences from their own perspective. The advantages and disadvantages to interviews were previously discussed on page 78-79.

Questions on the interview guide (see Appendix F) were intended to obtain more in-depth understanding of findings related to students' perspectives about the chat digital reference service in general, their interaction with the librarian, their interaction with the technology, their leaving the chat digital reference session, and their views on improving the service. Categories of and questions comprising the interview guide are further described below:

Chat digital reference service in general

This category of questions was asked to help jog the students' memory about their collaborative digital reference experience. Because some time may have expired since students' last chat digital reference encounter and their memories may have been somewhat clouded, students were asked a series of questions to induce them to talk about their positive and negative experiences with the chat digital reference service.

User-librarian interaction

According to Katz (2002) and Bopp (2001), much of users' satisfaction with reference services is dependent on their interaction with the librarian. Hence, questions were asked in this area to learn about students' values and attitudes concerning the librarian assisting them during their interaction with the chat digital reference service.

User interaction with the technology

It is reasonable to assume that some students are surprised when Web pages that they do not click on automatically open on their computer desktop. In some chat digital reference encounters, librarians leave users alone in sessions, presumably to open a session for another user. A number of transcripts with users in sessions alone, show them continuously clicking on links on the host library's Web pages. Also a number of users, who are left in sessions alone, leave the session prior to the return of the librarian. Considering such user behavior involving the chat technology, students were asked a series of questions about their likes and dislike

regarding their interactions with the chat digital reference service when co-browsing/escorting and Web page pushing features were employed.

Termination of the session

Several transcripts show students leaving the session in various ways: 1) at the end of the chat digital reference session; 2) before the chat digital reference session ends; and 3) without a librarian present in the chat digital reference session (this is seen in a number of discarded transcripts, particularly those labeled as *no interaction*). Also librarians tended to label, in their notes at the end of a transcript, users who left prior to the completion of the session as *lost patron.* Additionally, some pilot test results show that when users do leave at the end of a session, there tend to be something of a closing protocol, wherein users say *thanks, ok thanks, bye, goodbye* when they are nearing completion of the chat digital reference interaction. Therefore, a series of questions were asked of students to learn more about such behaviors when leaving a chat digital reference session.

Service improvement

It is conceivable that students interacting with the chat digital reference service form perceptions about the quality of the service and that such perceptions if known can be used to improve the service. Thus, students were asked a series of questions regarding what they considered as strengths and weaknesses of the chat digital reference service.

Validity and Reliability of the Interview Guide.

Interview questions were framed within the cognitive perspective, and specific questions were based on interpretations derived from the content analysis. In order to alleviate ambiguity, when asking questions the researcher devised questions based on the informal language used by participants during the chat digital reference interaction. Further, the flexible nature of qualitative design allowed for clarification of the interview by allowing the researcher to revise questions, to make changes in the interview guide, and to modify the interview process itself. This flexibility was especially useful when interviewing the first participant, which was used as a pilot test of the interview guide for face validity. Based on these findings, the interview guide was revised and used in the following interviews. Reflexivity and neutrality of the researcher also was used to enhance validity of the interview. That is, the researcher remained aware of her personal biases and experiences and depicted authenticity and reflexivity in assessing participants and events (Patton 2002).

The researcher uses a standardized open-ended interview guide, which allows her to ask all participants the same questions, which allows consistency in the asking of questions. The researcher also consistently makes reflexive notes during the interview process.

CHAPTER 4

RESULTS

This is a study of users' experiences in a digital reference environment employing collaborative tools, more specifically the needs, benefits, and barriers pertaining to users during information seeking via the Internet. Study results are reported below for each of these dimensions.

Content Analysis

Many codes for the content analysis component of the study are c*ontextual* and *interaction* related. They represent dimensions pertaining to library users during information seeking via the Internet reference service. Except for the *information need*, *contextual related* dimensions pertain to the physical environment itself and include more objective information about users prior to and/or at the end of their user-librarian interactions within the digital reference milieu, for example, dimensions such as *time of the transaction*, *user status*, and *user goals*. *Interaction* dimensions pertain to the back and forth, linguistic, and action related communications between user and librarian and between these participants and the collaborative tools used during the sessions. These dimensions include the cognitive, affective, and actions related states of users during information seeking.

As previously stated, except for the *information* need, *contextual* data generally have a single reality and are more objective. Given the data pertaining to this dimension, there are a number of descriptive statistical analyses that can be done. However, given the nature of this study, additional statistical analyses beyond frequency and percentage counts are beyond its scope.

With regard to *interactions,* some findings already have been reported in the *Settings* section of the *Methodology* for this dissertation. The section provides a discussion on *social interactions* of users and librarians as determined from findings of pilot tests of digital reference transcripts.

This section of the dissertation presents findings from a content analysis of 342 transcripts. As in the *Settings* section of the *Methodology*, *interaction related* dimensions include *social interactions* occurring between the *initiation* and *termination* of digital reference sessions. These interactions include communications such as *computer scripts,* expressions such as welcoming and closing greetings, and communications such as *abbreviations/emoticons*. Other *interaction* dimensions pertain to actions in which users engage in during their digital reference encounter.

In the findings reported below, because contextual data were less interpretative, they yield more definitive findings with percentages totaling 100% as expected. On the other hand, results for *interaction* data were more interpretative, thus yielding more overlapping dimensions with percentages totaling substantially more or less than 100%. Nevertheless, such percentages are used in results to provide a sense of the number of sessions including *digital collaborative strategies, psychological, barriers,* and related dimensions pertaining to user and librarian *interactions* in the chat digital reference environment.

Contextual Dimensions

Time of Transaction.

Findings show users contacting the chat digital reference service as early as 10:51 a.m. and as late as 9:03 p.m. The shortest session lasted about 0.5 minutes while the longest session lasted 87 minutes. The majority of sessions (54%, or 183 sessions) clustered at the low end at 15 minutes or less; 19 of these sessions were less than or equal to 1 - 5 minutes; 85 were between 6 and 10 minutes; and 79 were between 11 and 15 minutes. Thirty-four percent (117) of sessions ranged between 16 - 30 minutes, of which 57 lasted between 16 - 20 minutes, 35 between 21 - 25 minutes, and 25 between 26 - 30 minutes. Only 8% (29) of these sessions clustered within the range of 31 – 45 minutes, with 14 between 31 – 35 minutes, 10 between 36 – 40 minutes, and 5 from 41 to 45 minutes. Even fewer sessions clustered at the high end of 46 minutes or more (4%, or 13 sessions); of these 6 ranged between 46 - 50 minutes and 7 ranged from 51 and more than 60 minutes. The *average session length* for the 342 chat digital reference sessions was14:53 minutes.[22] See table 1 for examples of the number of transcripts falling within various session ranges.

[22]The value used for *average session length* represents the median, which was calculated using SPSS. Total session times for the 342 chat digital reference transcripts were imported into SPSS to conduct descriptive statistical

Table 1: Session range and frequency count of sessions falling within range.

SESSION RANGE (Min)	COUNT
≤1 - 5	19
6 - 10	85
11 - 15	79
16 - 20	57
21 - 25	35
26 - 30	25
31 - 35	14
36 - 40	10
41 - 45	5
46 - 50	6
51 - ≥60	7
TOTAL	**342**

It should be noted that the above *average session length* derived from a re-categorization of *end times* for 14 transcripts whose original session lengths were about 4 hours long. This finding was questionable and prompted a further review of these sessions. Further analysis showed that these transcript sessions had large gaps of time extending more than 3 hours between the last human speaker and the system disconnect time (typically the *end time*) (see transcripts #136262 and #394495, below). As a result of these findings, the system recorded *end time* in the questionable transcript sessions was replaced with the *end time* for the last human speaker in the session, thus yielding an *average session length* of about 15 minutes for the 342 transcript sessions. Prior to adjusting the 14 transcript *end times*, the average session length was about 27 minutes for the 342 transcript sessions. Excerpts below from transcripts are presented to illustrate these anomalies in session lengths:

1. Transcript #136262
2. STATUS: UNIV Graduate
3. **User:** I want to know where I can check the time of movies Thank you 2004-01-13 **14:31:34 PT**
4. Computer response: A librarian will be with you in about a minute.

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analysis. Analysis also produced averages for the *arithmetic means* (18:08) and the *mode* (14:56). Brewer (1996) states that it is best to use the median value as the average when data are ordinal or when there is large skewness in the data.

2004-01-13 14:31:46 PT

5. [. . .]
6. **User: Thank you so much.**
   2004-01-13 14:43:50 PT
7. Librarian: Will this answer your question.
   2004-01-13 14:44:20 PT
8. **User:** I will have a try. However I have to my experiment. Best,
   2004-01-13 **14:44:39 PT**
9. **Computer response:** [user has disconnected]
   2004-01-13 **18:31:59 PT**
10. Computer response: [user has closed this session]

In transcript #136262, the session appeared to end normally with the user showing *gratitude* (line 6) and formally closing the session at 14:44:39 (line 8). Although the session began at 14:31:34 (line 3), the user disconnected or ended the session at 18:31:59 (line 9), hence yielding a 4 hour session length. This resulted in a lengthy difference between the time recorded for the last human speaker and the system recorded time for the user disconnection from the chat digital reference service. Thus, 14:44:39, the time of the last human message in the session was selected as the *end time* for this digital reference session instead of the 18:31:59, the system recorded disconnect time for the user.

1. Transcript #394495
2. STATUS: UNIV Undergraduate
3. User: How do I get access to UNIV internet available texts from CDL
   2002-10-21 **15:01:43 PT**
4. Computer response: A librarian will be with you in about a minute.
   2002-10-21 15:02:08 PT
5. [. . .]
6. Librarian: does this help?
   2002-10-21 15:24:24 PT
7. **User: yes, thank you**
   2002-10-21 **15:24:26 PT**
8. User: !
   2002-10-21 15:24:49 PT
9. **Librarian: thanks for using Ask a Librarian**
   2002-10-21 15:26:36 PT
10. **User:** [Page sent] http://ejournals.ebsco.com/Issue.asp?IssueID=86934
    2002-10-21 **15:41:26 PT**
11. Computer response: [user - has disconnected]
    2002-10-21 19:02:06 PT
12. Computer response: [user has closed this session]

In transcript #394495, the *begin time* for the session was 15:01:43 (line 3) and the *end time* was19:02:06 for the session (line 11), for a 4 hour total session time. Preceding the system disconnect time, the user is seen at 15:41:26 hours pushing a Web page (line 10). The difference between the system disconnect time (*end time*) and the user Web page pushing time was 4 hours and 1 minute. As in the previous transcript, the last human recorded message or activity time replaced the system recorded disconnect or *end time* in order to obtain the average session length for the 342 transcript sessions. In general, this transcript session appeared to end normally with participants thanking each other (lines 7, 9). More on such closings will be discussed later in the dissertation.

Excessively long *end times*, thus long digital reference session times, in transcripts were considered anomalies. A closer look at these irregularities in transcript sessions showed that these extensive *end times* typically occurred at or near the end of the day. This led to the assumption that librarians left chat digital reference sessions prior to users without logging off in the 14 transcript sessions containing irregular *end times*.

User Status.

User status was another kind of *contextual* information represented in chat digital reference sessions where collaborative tools were utilized. In a few sessions, speakers' messages in transcripts indicated that they were in the session as *repeat users*; however, the data for this study were cleansed prior to analysis, making it essentially impossible to identify each user and to identify users who had previously interacted with the digital service. Because the number of transcript sessions in this study corresponded to the number of users participating in sessions, findings for the category *users status* are presented in terms of number of transcript sessions (N = 342). As indicated in the methodology chapter, students were the primary users targeted for this study. Categories and proportions of students participating in collaborative tool activities during the time of the study included 66% (226) *undergraduates*, 14% (48) *graduate*, 20% (67) *writing students*, and 1 *medical* student. In 2002, the number of students participating in collaborative tool activities in the chat digital reference service was low, including 11% (37) student sessions; in 2003, the number of students participating in sessions grew more than four fold, including 49% (166) student sessions; and for 2004 (three months), including 40% (139) student sessions. For the three months of 2004, the number of students participating in sessions was still larger than in 2002 (see table 2).

Table 2: Student status as count and percent of those participating in chat digital reference sessions incorporating collaborative tools; Years 2002-2004; N = 342.

STATUS	DATE							
	2004		2003		2002		TOTAL	
Undergraduate	79	23%	117	34%	30	9%	226	66%
Graduate	25	7%	18	5%	5	1%	48	14%
Writing	35	10%	30	9%	2	--	67	20%
Medical			1	--			1	
TOTAL	139	40%	166	49%	37	11%	342	100%

Because the study informant indicated that *writing students* were primarily *undergraduate students* and because the host library collected data on *undergraduate* and *writing students* status for the digital reference service, this study also retained the *writing student* category. Retention of this category was done not only to complete the dissertation but also to collect information that was meaningful and useful to the host library. Thus, there were 86% (293) *undergraduate students*, including *writing students* in sessions from 2002 to 2004.

User Goals.

Users in this study typically presented their information needs or goals as the first message to the chat digital reference service. Such presentations of needs generally started the session and typically appeared on line 3 of transcripts. The general initiation pattern in transcript sessions were as follows: 1) presentation of user needs (line 3); 2) two computer responses (lines 4-5); 3) librarian entered sessions and made some utterance that prompted the interaction; and 4) various participant interactions followed the librarian's prompt (lines 6); see the *Settings* section of the *Methodology* of this dissertation for more discussion on initiations, terminations, and interactions in sessions. Also see various transcripts throughout the *Results* section of the

dissertation for examples of how these initiation, interaction, and termination patterns appear in transcripts.

Users presented their *information needs* at the beginning of sessions in 99% (338) of the transcripts. In some transcripts, however, the need statements did not open the digital reference session. Some of these unusual sessions included returning users who had been involuntarily disconnected from a previous session. Examples of returning users who did not present their needs at the beginning of chat digital reference sessions are seen below in transcripts #149592 and #36455.

In transcript #149592, the session began with two-computer response statements (lines 3-4). This was a returning user from a previous session, as indicated by the librarian saying, "hi, you're back -" (line 5) and by the user saying, "I got kicked off" (line 8). Unlike the majority of transcript sessions in this study, the need statement does not open the digital reference session.

1. Transcript #149592
2. STATUS: UNIV Undergraduate
3. **Computer response: A librarian will be with you in about a minute.**
   2004-02- 3 14:45:56 PT []
4. **Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]**
   2004-02- 3 14:46:10 PT
5. **Librarian: hi, you're back -**
   2004-02- 3 14:46:25 PT
6. Librarian: please be patient - i'm finsihing one other call
   2004-02- 3 14:46:38 PT
7. User: hi
   2004-02- 3 14:46:43 PT
8. **User: I got kicked off**
   2004-02- 3 14:47:14 PT

Like transcript #149592 above, the session began for transcript #36455 without the user need statement. This session began with the user saying, "I am returning[]" (line 3), instead of with the computer responses as seen above.

1. Transcript #36455
2. Status: UNIV Undergraduate
3. **User: I am returning[]**
   2003-07-31 11:33:36 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-07-31 11:33:45 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]

2003-07-31 11:34:17 PT

6. Librarian: OK...Let's hope it works this time. I'm going to switch us to Dissertations international
   2003-07-31 11:34:41 PT
   [. . .]

Often reading far into the transcript was necessary before the researcher was able to decipher *information needs* in these *continuing* sessions with returning users; in some instances the need could not clearly be determined.

User-Librarian Interactions

Initiation.

As previously stated in the *Settings* section of the *Methodology* chapter, although the *information need* was submitted at the onset as the user connected to the digital reference service, initial interactions were generally librarian-driven. Thus, there were two types of initiations observed for these chat digital reference sessions: 1) the initiation of the session itself, generally beginning upon presentation of the initial *information need* (a user-driven process); and 2) the initiation of the first user-librarian interaction, generally beginning with utterances by the librarian prompting the interaction (a librarian-driven process). In other words, the back and forth between participants did not actually occur until the librarian entered the session with a *greeting*, question, or directive to the user. Information seekers occasionally included *greetings* such as *hi, hello,* and the like when they presented their needs as seen in transcripts #1213337 (line 3) and #1343999 (line 3). Such *greetings* were presented in 26% (86) of chat digital reference sessions. Occasionally, such user *greetings* were not reciprocated by librarians upon entering the session as seen below in transcripts #1213337, lines 9 and #1343999, lines 6):

1. Transcript #1213337
2. STATUS: UNIV Undergraduate
3. **User: Hi, I'm enrolled in Biology 142W. I have to do a research paper with the topic "Is Cloning Morally Acceptable?" I'm looking for an article that either supports or opposes cloning. How can I find it?**
4. 2003-03- 3 14:39:01 PT
5. Computer response: A librarian will be with you in about a minute.
6. 2003-03- 3 14:39:11 PT
7. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
8. 2003-03- 3 14:40:46 PT
9. **Librarian: does the article have to be from a scholarly journal? does it need to be in a biology journal or can it be in a sociology journal?**

10. 2003-03- 3 14:41:11 PT
11. [. . .]

1. Transcript #1343999
2. STATUS: UNIV Graduate[]
3. **User: Hello, I'm a medical student looking for an article on the effects of alcohol on anesthesia... I'm off campus and having a little trouble accessing articles. Can you please help?**
   2003-04- 2 11:24:14 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-04- 2 11:24:27 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2003-04- 2 11:24:51 PT
6. **Librarian: Sure.**
   2003-04- 2 11:25:20 PT
7. Librarian: you're having problems accessing the full text?
   2003-04- 2 11:25:30 PT
   [. . .]

Nevertheless, a large portion of sessions 97% (297) included librarians submitting both scripted and non-scripted *greetings*. Non-scripted *greetings* such as *hi, hello, howdy*, and the like were warm, personable, and were easily recognized as such. Conversely, many sessions included *scripted greetings* containing the pre-structured statement, "Welcome to Ask a Librarian LIVE! I'm reading your question..." This pre-structured script was not recognized as such until after the researcher had observed many of them. However, users did not have pre-structured scripts.

Termination.

While the majority of sessions ended *normally* 90% (307), typically with the user saying *thanks* and/or *goodbye* near the end of the session, several other patterns were also observed: 1) a few sessions (6%, or 20 sessions) ended with users leaving without a closing prompt or without any other notice to librarians that they were leaving the session, thus causing uncertainty for librarians about the status of the interaction (*evaporation*); 2) a few sessions appeared to end *abnormally* (3%, or 10 sessions), with users or/and librarians appearing to leave ongoing sessions abruptly; and 3) for some sessions (3%, or 9 sessions) it was difficult to determine whether the session ended *normally* or not (*can't determine*).

Like opening *greetings*, *goodbye* statements sometimes signified farewell and the end of a session. Unlike session *initiations*, closing statements appeared to be user-driven. That is,

users generally indicated that they were leaving or about to leave sessions, thus indicating session closings; oftentimes such protocols began with users saying *thanks* or *thank you*. More on this *thank you* type of closing protocol will be discussed further under *affective states*.

Transcript #1052121 includes what is believed to be an evaporating user, which is indicated by the librarian in the session expressing uncertainty about the status of the user by asking "still there?" (lines 9). Additionally, the *scripted* note, "Lost ref[erence]" (line 11) left by the librarian suggested an incomplete reference transaction.[23]

1. Transcript #1052121
2. STATUS: Writing 39C Student
3. User: topic: should juveniles be tried as adults? I did a lot of research on this topic already but i have a hard time finding out organizations or articles that advocate prosecuting juveniles as adults. I'm looking for counterarguement.
   2003-02- 5 11:19:54 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-02- 5 11:20:06 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2003-02- 5 11:20:14 PT
6. [. . .]
7. Librarian: ok, let me see....
   2003-02- 5 11:35:31 PT
8. Librarian: try this: For Internet Explorer: Under the Tools menu, choose Internet Options. Next, on the General tab, in the Temporary Internet Files section, click the "Delete Files" button. Finally, click "OK." Please let me know when you've finished, and I will try to send you webpages again.
   2003-02- 5 11:39:22 PT
9. **Librarian: still there?**
   2003-02- 5 11:40:38 PT
10. Librarian: sorry about that, here's the Web site for the FL attorney general's office...
    2003-02- 5 11:42:18 PT
11. **Librarian: note to staff: LOST-Ref**
    2003-02- 5 11:42:19 PT
12. Computer response: [librarian - user has closed this session]

Transcript #80717 illustrates a session ending abruptly right in the midst of participants interacting. Near the end of the session, the user is seen sending Web pages to the librarian (lines 13-14), possibly by clicking on hyperlinks in Web pages on his or her desktop. In the midst of all of this activity, this user appears to have been disconnected abruptly from the service

[23] Chat digital reference librarians used scripts such as *Lost-Dir, Lost-Hold, Lost-Ref, and Lost-Access* to denote sessions in which users disconnected prior to librarians answering or completely answering their queries. These terms also apply to sessions in which users disconnected prior to librarian entering the session.

as indicated by the librarian (lines 15). Again the note “LOST Ref[erence]” is left for staff, hence indicating the session was incomplete (lines 16-17).

1. Transcript #80717
2. Status: Writing 39C Student
3. User: i'm trying to find search results on workplace surveillance but more specifically, on customer surveillance on employees, i looked in a lot of the databases and couldn't really find anything, ny suggestions??????????? please help!!!!!!!1
   2003-10-16 17:13:01 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-10-16 17:13:17 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2003-10-16 17:14:29 PT
6. Librarian: Hi, let me look for a sec..be right with you...
   2003-10-16 17:15:54 PT
7. User: k
   2003-10-16 17:18:22 PT
8. User: im tying to connect my reserach to Nickel and Dimed in which customers spy on employees
   2003-10-16 17:18:33 PT
9. Librarian: OK--I found some articles in the database called ABI Inform (business and industry)...
   2003-10-16 17:18:47 PT
10. User: [Item sent - Article Databases (Univ Libraries)]
    http://www.lib.Univ.edu/online/databases.html
    2003-10-16 17:19:33 PT
11. User: [Item sent - Article Databases: A (Univ Libraries)]
    http://www.lib.Univ.edu/online/databases_a.html
    2003-10-16 17:19:40 PT
12. [. . .]
    2003-10-16 17:37:19 PT
13. **User: [Item sent - Advanced Search] http://proquest.umi.com/pqdweb?AT= [. . .]**
    2003-10-16 17:38:22 PT
14. **User: [Item sent - Advanced Search] http://proquest.umi.com/pqdweb?AT= [. . .]**
    2003-10-16 17:46:56 PT
15. **Librarian: sorry, I think we got disconnected. So you will get this transcriPT in your email. Hope this helps. Call again if you would like more assistance..Bye[].**
    2003-10-16 17:47:13 PT
16. **Librarian: Note to staff: LOST-Ref [librarian - user has closed this session]**
17. **Librarian: Note to staff: LOST-Access [librarian - user has closed this session]**

Unlike transcripts #1052121 and #80717 above, transcript #174717 shows a digital reference interaction in which the librarian closed the session with the user explicitly indicating that his or

her need has not fully been answered.[24] As the librarian closes the session telling the user *welcome* and *good luck* (line 15), presumably in response to the previous *thanks* by the user, the user is found saying near the end of the session "but i have another question"(line 14). Most likely the librarian has mistaken the "ok…thanks" (line 13) as an indicator that the user is ending the session.

1. Transcript #174717
2. STATUS: UNIV Undergraduate
3. User: Where do I click to go to PsychInfo?
   2004-03- 3 15:36:26 PT
4. Computer response: A librarian will be with you in about a minute.
   2004-03- 3 15:36:45 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2004-03- 3 15:36:58 PT
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
   2004-03- 3 15:37:38 PT
7. User: I'm in the main library webpage
   2004-03- 3 15:38:07 PT
8. [. . .]
9. User: [Item sent - Cambridge Scientific Abstracts Internet Database Service]
   http://oh1.csa.com/htbin/ids64/procskel.cgi
   2004-03- 3 15:42:27 PT
10. Librarian: No, you wouldn't be able to get in. At this point you may want to do an "Advanced Search" by clicking on that.
    2004-03- 3 15:42:58 PT
11. User: [Item sent - Site Banner]
    http://oh1.csa.com/htbin/ids64/procskel.cgi?fn=banner_advanc
12. ed.html&ctx=/wais/idstmp/ctxDCa45G
    2004-03- 3 15:43:55 PT
13. **User: ok...thanks**
    2004-03- 3 15:44:02 PT
14. **User: but i have another question[]**
    2004-03- 3 15:44:15 PT
15. **Librarian: You're welcome! Good luck!**
    2004-03- 3 15:44:28 PT
16. Librarian: Note to staff: COMP-Ref [librarian - user has closed this session]

[24] Presumably the user's additional question represents a shift in his or her original need statement, thus a *need change*.

Digital Collaborative activities.

Digital collaborative activities include strategies users and librarians employ in fulfilling the *information need*. As discussed below, such collaborative activities involved strategies such as using *scripted responses, asking questions,* using *abbreviations/emoticons, confirming/acknowledging, URL pushing*, and participating in *educational related* activities.

Scripted responses

As previously noted, two speakers (librarian and computer) in chat digital reference sessions used *scripted responses*. Librarian *scripted responses* were used in 95% (330) of these sessions, while computer *scripted responses* were used in 100% (342) of these sessions. Many librarian *scripts* were used as opening *greetings* (although the researcher did not recognize these as scripts until she had seen many of them). Conversely, computer *scripts* were used and easily recognized when used during opening and closing of sessions. As seen above in transcript #80717 (line 16-17), some librarian *scripts* took on less human-like qualities similar to computer *scripts*. These mechanical-like *scripts* included notes librarians left for other staff informing them of the status of the digital reference transaction. These scripts were generally left at or near the end of transcript sessions and indicated that participants' interactions had ended.

Asking Questions

Asking questions was a strategy used by participants to meet various *information needs*. Large numbers of sessions involved both users and librarians engaged in *asking questions.* As expected, librarian speakers in transcript sessions comprised the largest number of *asking questions.* For example, in 96% (327) of chat digital reference sessions, librarians asked questions, while in 71% (242) of these sessions users asked questions. Typically, librarians asked questions as part of the normal reference interview process.

Questions asked by users and librarians during chat digital reference sessions were not always formulated as grammatically correct questions, beginning with a *how, what, where*, and the like. As seen in quotes below from transcripts, participants in sessions occasionally used question marks at the end of statements and typically omitted one or two words needed to make a grammatical question. For example, in the first quote each instance of the passage seemed to lack only the words *do you* or *do I* to make a grammatically correct or explicit question. In the second quote the sentence also included all of the essential words needed to make it an explicit or grammatical question. However, the user made a statement and turned it into a question with

the question mark. In other words, the user seemed to be saying in this quote, *okay, so through that i will be able to access ASAP* [Is that right]?

- *ok; no problem. see the left margin where it says "connect from off-campus"?[];" "i think im okay, so i just follow the directions to set up the proxy server?*
- *okay, so through that i will be able to access ASAP?*
- *okay, but you don't think i'll find any like scientific books?*

User questions after the initiating question (*information need*) generally represented a shift in the *information need* (*need change*), while librarian questions typically represented a negotiation with the user in his or her *information need*. That is, both the shift in need and the need negotiation seek clarity in order to better focus the *information need*. Examples of *need changes* and question-negotiations are provided in transcript #10009. Notice how the user's original *need changed* from lawsuits for a particular state (line 3) to the need to know how to get back to the search page (line 15) and to whether there were journals on the topic (line 25). On the other hand, the librarian sought to gain a focus by *asking questions*. For example, the librarian asked the user whether s/he knew how to use LexisNexis (lines 5-6); whether his or her screen changed to article database (line 10); whether s/he was at home or not (line 16); whether s/he wanted to make changes in the search (line 20); and whether s/he wanted lawsuits only for a particular state (line 22).

1. Transcript #10009
2. STATUS: Writing 39C Student
3. **User: Where would I look for information about lawsuits in [state name]?**
   2003-05-27 11:08:31 PT
4. [. . .]
5. **Librarian: I would suggest that we start looking in LexisNexis**
   2003-05-27 11:12:19 PT
6. **Librarian: Do you know how to use that?**
   2003-05-27 11:12:32 PT
7. User: No, I don't...
   2003-05-27 11:13:06 PT
8. Librarian: OK---hold on for a couple of minutes and I'll connect our two computers.[]
   2003-05-27 11:13:31 PT
9. Librarian: [Item sent - Article Databases (Univ Libraries)]
   http://www.lib.Univ.edu/online[. . .]
   2003-05-27 11:13:45 PT
10. **Librarian: Did your screen change to the article database?**
    2003-05-27 11:13:57 PT
11. User: yes

2003-05-27 11:14:13 PT

12. Librarian: This is the one we need to use for LexisNexis. I'm clicking on L and going there....
    2003-05-27 11:14:16 PT
13. [. . .] [Librarian pushes pages]
14. Librarian: We can each try doing the search separately and see if we can get through....
    2003-05-27 11:17:31 PT
15. **User: ok, how do i get back to the search page?**
    2003-05-27 11:17:46 PT
16. **Librarian: Are you at home or in the library?**
    2003-05-27 11:17:54 PT
17. User: at the library
    2003-05-27 11:18:25 PT
18. Librarian: OK---then, you can use the back button on the upper left hand corner of the screen. I'll take us back to the search page
    2003-05-27 11:18:27 PT
19. Librarian: [Item sent - LexisNexis™ Academic Search Page] http://web.lexis-[. .]
    2003-05-27 11:18:42 PT
20. **Librarian: Do you want to make a change in the search?**
    2003-05-27 11:19:18 PT
21. User: I'm looking for lawsuits that are specifically related to skateboard injuries
    2003-05-27 11:19:47 PT
22. **Librarian: Do you want them only for [state name]?**
    2003-05-27 11:20:28 PT
23. Librarian: [Item sent - LexisNexis(TM) Academic Error Page] [. . .]
    2003-05-27 11:21:02 PT
24. User: it doesn't have to be just in [state name abbreviated]
    2003-05-27 11:22:23 PT
25. **User: are there any other journals that I could look for?[]**
    2003-05-27 11:23:07 PT
26. Librarian: Yes---I was just doing a search of Lexis nexis in another window.....
    2003-05-27 11:23:28 PT
27. [. . .] [Librar]ian pushed URLs
28. Librarian: Can you use newspaper articles?
    2003-05-27 11:27:19 PT
29. User: yes
    2003-05-27 11:28:23 PT
30. [. . .]

In some instances users and librarians were uncertain about the status of the digital reference interaction itself. For example, transcript #230792 is an instance of the librarian asking the user, *are you there?* (line 9), when, in fact, the user is still online, as seen in his or her response of *yes* (line 10):

1. Transcript #230792
2. STATUS: Univ Undergraduate
3. User: how many patents have been given in 2003?
   2004-05-11 15:32:38 PT
4. Computer response: A librarian will be with you in about a minute.
   2004-05-11 15:32:50 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2004-05-11 15:33:02 PT
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
   2004-05-11 15:33:17 PT
7. Librarian: Do you need to know how many patents the U.S. granted in 2003?
   2004-05-11 15:34:18 PT
8. User: yes, how many us patents & how many patents for other countrys (m/be china or india)?[]
   2004-05-11 15:34:19 PT
9. **Librarian: Are you there?[]**
10. **User: yes, i'm here**
    2004-05-11 15:35:01 PT
11. [. . .]

Transcript #1005192 shows both the user and librarian displaying uncertainty about the online presence of each other. First the librarian asks *are you there?* This is followed by the user responding *hi* (lines 5-6). Later during the session, the user was unsure whether or not the librarian was still in the session (line 11). However, the librarian responds *yes* to confirm his or her online status (line 12).

1. Transcript #1005192
2. STATUS: Writing 39C Student
3. User: i don't know what kind of keywords i should use to find article inthe expanded article databases for ACLU on the topic of prosecuting juveniles as adults. I already tried...some but it won't work
   2003-01-28 12:04:01 PT
   [. . .]
4. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
   2003-01-28 12:04:34 PT
5. **Librarian: Are you there?**
   2003-01-28 12:04:42 PT
6. **User: hi**
   2003-01-28 12:04:55 PT
7. Librarian: Great.
   2003-01-28 12:04:59 PT
8. [. . .]
9. Librarian: There may be a position statement on the ACLU web page.
   2003-01-28 12:10:14 PT

10. Librarian: go ahead, sorry.
    2003-01-28 12:11:14 PT
11. User: are you still there
    2003-01-28 12:11:23 PT
12. Librarian: Yes
    2003-01-28 12:11:27 PT
13. User: hmm..can i push the back
    2003-01-28 12:11:39 PT

Abbreviations/emoticons

Users employed *abbreviations/emoticons* to communicate in 23% (79) of chat digital reference sessions, whereas librarians employed these in 18% (62) of sessions. Participants in interactions sometimes used these expressions as a shorthand form of words such as *thanks, your*, and *you*; or used these expressions as shorthand for visual cues such as facial expressions, for example smiling faces, frowns, sad faces, and the like.

The examples below are presented to demonstrate how *abbreviations/emoticons* were used in chat digital reference sessions as shorthand forms of commonly used expressions. The following quotes show *thx* being used as a shorthand form of *thanks* or *thank you*, a form of gratitude.

- *thx, bye!*
- *thx I will check out*

The expression *k* was commonly used as a shorthand way of saying *ok*. When *k* was used during interactions, it was typically used as a single utterance as seen below in transcripts #145556 (line 4) and #1343999 (line 4):

1. Transcript #145556
2. STATUS: Writing 39C Student
3. [. . .]
   2004-01-28 14:18:59 PT
4. User: k
   2004-01-28 14:19:43 PT
5. Librarian: ok, that link isn't working...what article are you trying to get?
   2004-01-28 14:20:16 PT
6. [. . .]

1. Transcript #1343999
2. STATUS: UNIV Graduate[]
3. [. . .]
4. User: k

2003-04- 2 12:10:34 PT

5. **Librarian: This is harder than I thought it might be ;-)**
   2003-04- 2 12:10:43 PT
6. **User: :-)**
   2003-04- 2 12:10:56 PT
7. [. . .]

Many sessions employed the use of smiley faces as seen above in transcript #1343999 (lines 5-6) and below in transcript #1249792 (line 5). In many instances, the librarian incorporated emoticons at the end of her or his message.

1. Transcript #1249792
2. STATUS: UNIV Undergraduate
3. [. . .]
4. User: Oh so I just go there and ask for Book 4204?
   2003-03-13 11:13:46 PT
5. **Librarian: That's it! :-)**
   2003-03-13 11:14:02 PT
6. User: Ooh... one more question... It costs $2/hr for borrowing it?
   2003-03-13 11:14:06 PT
7. [. . .]

A few sessions showed the information seekers deviating from typical smiley faces. As seen below in transcript #152444 (line 5), the information seeker used inverted carets and the underline rather than the typically seen hyphen, colon, and parenthesis as a smiley face:

1. Transcript #152444
2. STATUS: Writing 39C Student
3. [. . . .]
4. Librarian: well, actually, yes, i was supposed to end at 3 but i can finish helping you...
   2004-02- 6 15:40:34 PT
5. **User: thank you!! ^__^**
   2004-02- 6 15:40:52 PT
6. User: ok... so i'm at PAIS International now
   2004-02- 6 15:41:47 PT
7. [. . .]

Other common abbreviations in sessions for this digital reference service were the use of *u* for *you* and *ur* for *your*.

- *do u have any tips on searching? cos I tried that on Saturday and didnt get many useful results .*
- *or more like we will give u amnisty if u want citazenship .*
- *hope I didn't keep you from ur lunch*
- *ok i think i know what to do now...thanks!! byebye. thanks for ur help!*

Finally, several sessions showed participants using *ic* as a quick way of saying *I see* as seen in transcripts #1462177 (line 5) and #450719 (line 6):

1. Transcript #1462177
2. STATUS: UNIV Undergraduate
3. [. . .]
4. Librarian: I'm having a hard time getting the e-link to open.
   2003-04-24 16:42:17 PT
5. **User: ic**
   2003-04-24 16:42:33 PT
6. Librarian: I'll try again but I don't think we have full text for this journal---Harvard Educational Review
   2003-04-24 16:43:43 PT
7. [. . .]

1. Transcript #450719
2. STATUS: Univ Undergraduate
3. [. . .]
4. Librarian: The ones with the page of paper and camera icon have the text online.
   2002-10-28 11:23:37 PT
5. User: Thank you for your help
   2002-10-28 11:23:52 PT
6. **User: ic**
   2002-10-28 11:24:02 PT
7. Librarian: If the page of paper has an 'A' over it, you'll get the abstract, or summary only.
   2002-10-28 11:24:26 PT
8. [. . .]

Confirming/acknowledging

Another strategy employed by users and librarians during chat digital reference interactions was using *confirming/acknowledging* remarks. Here users responded *yes*, *no*, or the like to librarian questions regarding whether they had received Web pages or could see content or objects on pages for databases or the OPAC (*information received*). In 34% (115) of chat digital reference sessions, users responded with utterances considered as *information received*. Examples are provided below in transcripts #10009 and #192298. As indicated in transcript #10009, the librarian implemented co-browsing/escorting features and then pushed a Web page to the article database (lines 8-9). Following this, the librarian asked, “Did your screen change to the article database?” (line 10), to which the user responded, “yes,” confirming that the information had been received (line 11).

1. Transcript #10009
2. STATUS: Writing 39C Student
3. User: Where would I look for information about lawsuits in [state name]?
   2003-05-27 11:08:31 PT
4. [. . .]
5. Librarian: I would suggest that we start looking in LexisNexis
   2003-05-27 11:12:19 PT
6. Librarian: Do you know how to use that?
   2003-05-27 11:12:32 PT
7. User: No, I don't...
   2003-05-27 11:13:06 PT
8. **Librarian: OK---hold on for a couple of minutes and I'll connect our two computers.[]**
   2003-05-27 11:13:31 PT
9. **Librarian: [Item sent - Article Databases (Univ Libraries)] http://www.lib.Univ.edu/online/databases.html**
   2003-05-27 11:13:45 PT
10. **Librarian: Did your screen change to the article database?**
    2003-05-27 11:13:57 PT
11. **User: yes**
    2003-05-27 11:14:13 PT
12. Librarian: This is the one we need to use for LexisNexis. I'm clicking on L and going there....
    2003-05-27 11:14:16 PT
13. [. . .]

Transcript #192298 is another example of the *information received* for *confirming/acknowledging* response by users. In this transcript the librarian pushed the Web page for the OPAC and asked the user "do you see the [OPAC NAME] screen?" (lines 9, 11). The user responded, "yes" to this question (line 12). This pattern was seen throughout this digital reference session in which the librarian pushed Web pages and then asked the user whether s/he saw specific content on the page (lines 20, 24, 27). To such questions, the user responded "yes" (lines 21, 25, 28).[25] A closer look at what users were responding "yes" to also indicated that in some instances these *confirming/acknowledging* responses were suggestive of *browsing*. Although users did not explicitly say *I see* the page or object, they were responding to the librarian's question of "can you see" something on the Web page.

1. Transcript #192298
2. STATUS: UNIV Undergraduate

[25] Perhaps this practice of pushing pages and immediately asking questions can be considered as a *best practice* for librarians pushing sequential pages in chat digital reference services.

3. User: what is the best place to find information on the history of Maquiladora (or American Industry in mexico), as well as current information?
   2004-03-23 17:11:51 PT
4. [. . .]
5. Librarian: Where have you looked so far?
   2004-03-23 17:13:10 PT
6. User: lenix[]
   2004-03-23 17:13:57 PT
7. Librarian: What is Lenix? Anyway, have you searched OPAC NAME using the keyword Maquiladora?
   2004-03-23 17:14:20 PT
8. User: no
   2004-03-23 17:14:38 PT
9. **Librarian: [Page sent - OPAC NAME] http://OPAC Name.lib.univ.edu**
   2004-03-23 17:15:23 PT
10. User: ok should I look under keywords
    2004-03-23 17:15:51 PT
11. **Librarian: do you see the OPAC NAME screen?**
    2004-03-23 17:16:02 PT
12. **User: yes**
    2004-03-23 17:16:03 PT
13. Librarian: [Page sent - Keyword Search] http://OPAC Name.lib.univ.edu/search/X
    2004-03-23 17:16:35 PT
14. [. . .]
15. Librarian: If you see what I am doing, just watch.[]
    2004-03-23 17:17:05 PT
16. Librarian: [Page sent - University /All Locations] http://OPAC[. . .]
    2004-03-23 17:17:08 PT
17. User: ok
    2004-03-23 17:17:19 PT
18. Librarian: [Page sent - University /All Locations] http://OPAC[. . .]
    2004-03-23 17:17:32 PT
19. [. . .]
20. **Librarian: Do you see the various records and issues concerning maquiladoras?**
    2004-03-23 17:18:49 PT
21. **User: yes**
    2004-03-23 17:19:04 PT
22. Librarian: OK let us return to the list of titles.
    2004-03-23 17:19:12 PT
23. Librarian: [Page sent - University /All Locations] http://OPAC[. . .][. . .]
24. **Librarian: This it a 1990 book which may be OK for a history. Do you see the location and call number?**
    2004-03-23 17:21:35 PT
25. **User: yes**
    2004-03-23 17:21:49 PT
26. [. . .]

27. Librarian: Do you see me typing in the ASAP window?
2004-03-23 17:27:48 PT
28. User: yes
2004-03-23 17:28:10 PT
29. Librarian: [Page sent - Citations 1 to 20 (of 248)] http://web7.[. . .]
2004-03-23 17:28:13 PT
30. [. . .]

Users also made more explicit utterances pertaining to *information received*. Below are examples of responses by users indicating whether or not they received a particular link, Web page, and related objects sent by the librarian:

- *i didnt get any page .*
- *i've recevied it [the OPAC Web page, sic].*
- *yes, I got the opac page .*

Like the *information received confirming/acknowledging* responses of *yes, no*, or the like to librarian questions, users also responded accordingly to librarian questions related to whether they followed or understood the librarian (*follows librarian*). In 19% (65) of these sessions, users indicated that they understood or followed the librarian during *demonstrations* and/or *instruction* related activities. In many instances of *information received*, when users responded *yes* to librarian questions such as, *can you see* or *do you see* such and such, it also overlapped with *browsing,* which will be further discussed below.

An example of the *follows librarian* code is seen in transcript #1229715. The user made a *confirming/acknowledging* response employing *I seeeee now* (lines 11, 26), which seemed to suggest an understanding of what the librarian said. However, it was not always certain for which line the response was intended.

1. Transcript #1229715
2. STATUS: UNIV Undergraduate
3. User: hi, i'm looking for articles on alzheimers for my extra credit paper. I don't know where to start.
   2003-03- 7 13:26:06 PT
4. [. . .]
5. Librarian: how many articles did you find?
   2003-03- 7 13:34:51 PT
6. User: only 3 were displayed
   2003-03- 7 13:35:08 PT
7. Librarian: hmmmmm.....hold on a sec....
   2003-03- 7 13:36:44 PT
8. Librarian: did you spell it right?

2003-03- 7 13:37:05 PT

9. Librarian: i just tried a search for alzheimers and got over 11,000 records...waaaaaay too many....
   2003-03- 7 13:37:06 PT
10. User: yea, alzheimers right?
    2003-03- 7 13:38:16 PT
11. **User: oh i seeeee now**
    2003-03- 7 13:38:18 PT
12. Librarian: did you limit your search to any specific dates or anything else?
    2003-03- 7 13:38:31 PT
13. Librarian: too many, right?
    2003-03- 7 13:38:39 PT
14. User: heheh
    2003-03- 7 13:38:47 PT
15. User: thank you soo much!
    2003-03- 7 13:39:00 PT
16. Librarian: wait! there's more...
    2003-03- 7 13:39:07 PT
17. User: there's more?
    2003-03- 7 13:39:10 PT
18. Librarian: one strategy is to do an AND search
    2003-03- 7 13:39:23 PT
19. Librarian: yes! there's more, ha ha ha!
    2003-03- 7 13:39:32 PT
20. User: an And search?
    2003-03- 7 13:39:52 PT
21. Librarian: yup! combine your topic with another one, like memory....
    2003-03- 7 13:40:09 PT
22. Librarian: the other thing you can do is limit to the past 4-5 years (since you only want the most recent research),
    2003-03- 7 13:40:15 PT
23. Librarian: and then limit to only journal articles...
    2003-03- 7 13:40:46 PT
24. Librarian: that will help you focus your search AND get to a manageable number of results!
    2003-03- 7 13:40:50 PT
25. Librarian: one more thing....
    2003-03- 7 13:40:53 PT
26. **User: i seee**
    2003-03- 7 13:40:57 PT
27. User: wow
    2003-03- 7 13:41:00 PT
28. User: i never knew
    2003-03- 7 13:41:27 PT
29. Librarian: AND is a small word with lots of uses!
30. 2003-03- 7 13:41:39 PT

Occasionally, users made more explicit statements to indicate they understood or followed what the librarian said. The following excerpts from transcripts provide examples of user utterances suggestive of *following* or understanding the librarian:

- *OH ok. That makes more sense. So I would have to search it under [the OPAC]*
- *I think i can handle it from here on*
- *yes I follow you*

A large number of sessions (91%, or 310 sessions) included *confirming/acknowledging* remarks by users and by librarians (61%, or 241 sessions) that appeared to be communication fillers, for example *uhm, ok, yes, no, oh,* and the like. There were also general *confirming/acknowledging* responses of *yes, no*, or the like to questions, which were not in the context of *information received* or *follows librarian*.

URL Pushing

The number of digital reference sessions with *page pushing* activities was slightly higher for the librarian than the user. In 76% (260) of these sessions the librarian did the pushing of pages, while in 66% (225) of these sessions it was the user doing the pushing. In 24% (82) of these sessions the librarian did the *pasting-in* of URLs, while in 5% or only 17 of these sessions it was the user *pasting-in* URLs. Still there were *other* sessions where participants talked about sending or pushing a Web page or URL; in four percent or 12 of these sessions were users and 18% (60) were librarians. URLs were sent during chat digital reference sessions either as pushed pages (*page sent*) or as *pasted-in* URLs. Moreover, several observations stood out regarding *page sent*:

1. Words such as *error*, *search, browse,* and specific search terms sometimes were embedded within text following the *page sent* and *item sent* labels that preceded URLs;
2. Librarians were seen clicking on or pushing many URLs or pages within the same session without any utterances between the pushing; and
3. Users were seen clicking on or pushing many URLs or pages within the same session, even without prompts from librarians. Similar types of user behaviors were observed in several sessions in the discarded transcript batch for this study. For further discussion pertaining to these discards, see the isolation of transcripts in the *Methodology* section of this dissertation.

Text following the *page sent* or *item sent* labels and even the URLs themselves appeared to tell much about what was going on within the chat digital reference session. Embedded within the *page sent* text following the URLs of transcript #145594 (line 8, 10, 12) was the word *error*, indicating that some technological constraint occurred within the session. The user's comment, "i keep getting an error page" confirms the occurrence of an error within this session (line 13).

1. Transcript #145594
2. STATUS: Writing 39C Student
3. User: I'm using lexisnexis statistical database to search for statistics on dental coverage and low wage employers but i can't seem to find any. What should I type in the keyword box?
   2004-01-28 14:40:00 PT
4. [. . .]
5. User: [Item sent - LexisNexis(TM) Statistical Search Page] http://web.lexis-nexis.com/statuniv
   2004-01-28 14:51:25 PT
6. Librarian: here's what i tried...once you get all the results type in the "FOCUS" box: dental or dentist or dentist or dentistry
   2004-01-28 14:51:41 PT
7. Librarian: ...that limits the search a lot
   2004-01-28 14:51:59 PT
8. **User: [Item sent - LexisNexis(TM) Statistical Error Page] http://web.lexis-nexis.com/statuniv/reqhandler**
   2004-01-28 14:52:07 PT
9. Librarian: ...you may to have to find tables about health ins and dental costs and do your own comparisons
   2004-01-28 14:52:33 PT
10. **User: [Item sent - LexisNexis(TM) Statistical Error Page] http://web.lexis-nexis.com/statuniv/reqhandler**
    2004-01-28 14:53:02 PT
11. Librarian: let me know how that's going?[]
    2004-01-28 14:53:06 PT
12. **User: [Item sent - LexisNexis(TM) Statistical Error Page] http://web.lexis-nexis.com/statuniv/reqhandler**
    2004-01-28 14:53:19 PT
13. **User: i keep getting an error page**
    2004-01-28 14:53:43 PT
14. Librarian: did you limit to last 5 years?
    2004-01-28 14:53:59 PT
15. [. . .]

Other URLs included the words *search* and specific search terms embedded within *page sent* or *item sent* labels preceded URLs, see transcript #23920. Two URLs indicated that the user was engaged in search activities. One URL suggested that the user was conducting a keyword search

in the OPAC (line 11), while the other URL suggested that the user was conducting a search in the OPAC on "amy + tan" (Line 22). The user indicated in line 13 that the *search* did not work. Thus, utterances and URLs in the digital reference sessions suggest that URLs can serve as indicators of user and librarian activities during sessions.

1. Transcript #23920
2. STATUS: UNIV Graduate
3. User: I'm going on a road trip and wanted to take some books-on-cd. does the library have these? how do i do a search by media type?
   2003-07- 1 12:10:29 PT
4. [. . .]
5. Librarian: go to OPAC: opac.lib.Univ.edu
   2003-07- 1 12:19:57 PT
6. User: [Item sent - OPAC Web/Univ Libraries Public Access Catalog] http://opac.lib.Univ.edu/
   2003-07- 1 12:19:59 PT
7. Librarian: click on keyword
   2003-07- 1 12:20:58 PT
8. Librarian: in the search box, type: electronic
   2003-07- 1 12:21:27 PT
9. Librarian: in the pull down menus, select "book" for material type and "Main-Media Ctr" for location....
   2003-07- 1 12:22:03 PT
10. Librarian: you'll get books are either on cds or are accompanied by cds...
    2003-07- 1 12:22:22 PT
11. **User: [Item sent - Keyword Search] http://opac.lib.Univ.edu/search/X**
    2003-07- 1 12:23:08 PT
12. User: trying that...
    2003-07- 1 12:24:31 PT
13. **User: the search isn't working in this window, but came up with 146 lines in another... i'll browse them. thank you.**
    2003-07- 1 12:25:14 PT
14. [. . .]
    2003-07- 1 12:27:50 PT
15. Librarian: if you identify a broad call number category, such as PS 3558, you can search it as a call number ...let me show you...it will take a minute to send the page to you...
    2003-07- 1 12:28:44 PT
16. Librarian: [Item sent - OPAC Web/Univ Libraries Public Access Catalog] http://opac.lib.Univ.edu/
    2003-07- 1 12:28:45 PT
17. User: [Item sent - OPAC Web/Univ Libraries Public Access Catalog] http://opac.lib.Univ.edu/
    2003-07- 1 12:28:56 PT
18. Librarian: do you see the opac page

2003-07- 1 12:29:05 PT
19. User: yep...
    2003-07- 1 12:29:25 PT
20. Librarian: OK, click on author
    2003-07- 1 12:29:45 PT
21. Librarian: and search for an author you are interested in
    2003-07- 1 12:30:07 PT
22. **User: [Item sent - University /All Locations] http://opac.lib.Univ.edu/search/a?SEARCH=amy+tan**
    2003-07- 1 12:30:22 PT
23. [. . .]

Some transcripts show participants engaged in chat digital reference sessions pushing several Web pages successively without any utterance between pages pushed. Below are excerpts from transcript #966829 to illustrate this uninterrupted interactive *page pushing* behavior by participants. As indicated by texts accompanying the URLs, the librarian tried to link to the Web site for the *LA Times* (lines 6-9, 12, 14). Upon sending the first URL, the librarian alerted the user of what to expect prior to pushing the pages. For example, the librarian said, "As I go to different web sites, your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an 'item sent' message in the chat box. Ready?" (line 5).

1. Transcript #966829
2. STATUS: UNIV Undergraduate
3. User: Hi, is this the librarian I spoke to earlier? If so, I noticed the classifieds aren't listed for the dates: Jan 5th, 12th, and 19th
   2003-01-23 16:38:40 PT
4. [. . .]
5. **Librarian: As I go to different web sites, your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an "item sent" message in the chat box. Ready?**
   2003-01-23 16:41:29 PT
6. **Librarian: [Page sent] http://www.latimes.com**
   2003-01-23 16:41:39 PT
7. **Librarian: [Page sent] http://adserver.trb.com/html.ng/site=latimes[. . .]**
   2003-01-23 16:41:48 PT
8. **Librarian: [Page sent] http://www.latimes.com/classified/leftnav/main**
   2003-01-23 16:41:54 PT
9. **Librarian: [Page sent] http://adserver.trb.com/html.ng/site=latimes&[. . .]**
   2003-01-23 16:42:05 PT
10. Librarian: My green cursor arrow will show you where I'm going to click next...
    2003-01-23 16:42:17 PT
11. User: ok

2003-01-23 16:42:28 PT

12. **Librarian: [Page sent] http://www.latimes.com/classified/jobs/**
    2003-01-23 16:42:50 PT
13. Librarian: [Page sent] http://www.careerbuilder.com/JobSeeker/HourlyJobsForm [. . .]
    2003-01-23 16:42:50 PT
14. **Librarian: [Page sent] http://www.latimes.com/classified/jobs/**
    2003-01-23 16:43:00 PT
15. Librarian: ooops...wrong thing...
    2003-01-23 16:43:49 PT
16. Librarian: [Page sent] http://www.latimes.com/classified/jobs/
    2003-01-23 16:44:07 PT
17. Librarian: Man, for some reason it won't go to the adv search page...
    2003-01-23 16:44:37 PT
18. [. . .]
    2003-01-23 16:48:29 PT
19. Librarian: [Page sent] http://www.careerbuilder.com/jobseeker/jobs/jobfindall.asp?c[. . .]
    2003-01-23 16:48:46 PT
20. User: It has to be la times
    2003-01-23 16:48:54 PT
21. Librarian: [Page sent] http://www.latimes.com/classified/jobs/
    2003-01-23 16:48:57 PT
22. [. . .]

Conversely, Transcript #524579 (lines 15-19) below shows the user engaging in a series of *page pushing* activities, presumably to conduct a search in the OPAC:

1. Transcript #524579
2. STATUS: Univ Undergraduate
3. User: I have some references that I wanted to check if you have them on line. If I list them, would you be able to help me out? tnx
   2002-11-22 14:24:03 PT
4. [. . .]
5. Librarian: http://opac.lib.univ.edu/search/t?SEARCH=current+protocols+in+molecular+biology
   2002-11-22 14:36:37 PT
6. Librarian: see is this url works, if not just use [Opac name]
   2002-11-22 14:36:42 PT
7. Librarian: [Page sent] http://opac.lib.univ.edu
   2002-11-22 14:36:48 PT
8. User: Miller, M. J. Wrightsman, R. A. and Manning, J.E> (1996). Trypanosoma Cruzi: Protective immunity in Mice immunized with paraflagellar Rod proteins is associated with a T-Helper Type 1 response. Experimental parasitology. 84: 156-157
   2002-11-22 14:37:10 PT
9. Librarian: put in the title of the book
   2002-11-22 14:37:43 PT

10. Librarian: I will look for you second title
    2002-11-22 14:37:53 PT
11. User: you mean choose author
    2002-11-22 14:38:10 PT
12. User: and then put the name of him there and seach the [opac]?
    2002-11-22 14:38:16 PT
13. Librarian: no, title
    2002-11-22 14:38:43 PT
14. Librarian: just title no autor
    2002-11-22 14:38:50 PT
15. **User: [Page sent] http://opac.lib.univ.edu/search/a**
    2002-11-22 14:39:25 PT
16. **User: [Page sent] http://opac.lib.univ.edu**
    2002-11-22 14:39:52 PT
17. **User: [Page sent] http://opac.lib.univ.edu**
    2002-11-22 14:40:06 PT
18. **User: [Page sent] http://opac.lib.univ.edu**
    2002-11-22 14:40:12 PT
19. **User: [Page sent] http://opac.lib.univ.edu/search/t**
    2002-11-22 14:40:14 PT
20. User: I pressed the Title,jounal
    2002-11-22 14:40:20 PT
21. User: now the title right?
    2002-11-22 14:40:20 PT
22. User: ok
    2002-11-22 14:40:37 PT
23. [. .]

Users did not always send URLs as a *page push* during chat digital reference sessions but sent them as *pasted-in* URLs. These generally were sent to provide the librarian information relevant to focus the *information need*. Examples of this are seen in transcripts #187255 (line 14) and #13068 (line 13):

1. Transcript #187255
2. STATUS: UNIV Graduate
3. User: I'm looking for a picture that appeared in the Long Beach Press-Telegram newspaper in July 2002. Does UNIV carry microfiches of that paper, or just text-only records? Thanks.
4. 2004-03-17 14:48:47 PT
5. [. . .]
6. Librarian: Were you following along?
7. 2004-03-17 14:55:45 PT
8. Librarian: I'm sorry, I thought you could see
   2004-03-17 14:56:04 PT
9. User: see message below -> co-browsing not supported.
   2004-03-17 14:56:28 PT

10. Librarian: Well, I looked in OPAC Name for The Telegram, and UNIV did not carry this
    2004-03-17 14:57:09 PT
11. Librarian: My apologies for not seeing that
    2004-03-17 14:57:26 PT
12. Librarian: I also do not have the newspaper at UNIV
    2004-03-17 14:57:39 PT
13. Librarian: I will check in [System name] for it
    2004-03-17 14:57:43 PT
14. **User: i looked on the website (http://www.lib.univ.edu/online/news.html) and it says it's available via newsbank. not sure if that is microfiche or text only. can you please check?**
    2004-03-17 14:59:23 PT
15. Librarian: It is avaialble at the {State name] State Library
    2004-03-17 14:59:49 PT
16. [. . .]

1. Transcript #13068
2. STATUS: UNIV Undergraduate
3. User: Humanities Core Student, Where do i locate the article I want to read from the America: History and Life search, (ABC-CLIO)?
   2003-06- 3 11:38:53 PT
4. Computer response: A librarian will be with you in about a minute.
5. 2003-06- 3 11:39:12 PT
6. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2003-06- 3 11:39:28 PT
7. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
8. 2003-06- 3 11:40:53 PT
9. Librarian: Hi. Sorry about the delay. I had another question.....
   2003-06- 3 11:41:04 PT
10. User: no problem
    2003-06- 3 11:41:24 PT
11. User: i can send the link
12. 2003-06- 3 11:41:31 PT
13. **User: http://serials.abc-clio.com/active/go/ABC-Clio-Serials**
    2003-06- 3 11:41:43 PT
14. Librarian: You should now have the UNIV Libraries home page in front of you....I am going to walk you through the process of locating an American History and Life article.....
    2003-06- 3 11:41:56 PT
15. [. . .]

Other activities involving collaborative tools included *browsing* and *co-browsing*.

Librarians, who dominated interactions in many of these sessions, were found talking about

browsing about twice as much as users. Of these sessions, 59% (203) included librarians talking about *browsing*. Librarians oftentimes asked users if they could see specific content or related objects on the library Web site or the OPAC. Additionally, 30% (103) of these sessions included users confirming or explicitly making utterances pertaining to browsing specific objects. As previously discussed, a number of *confirming/acknowledging* responses for *information received* involved the user responding *yes* to indicate *seeing* the library home page, the OPAC, the arrow, or something else displayed on the Web site. Transcripts #192298 (lines 12, 21, 25, 28) and #10009 (line 11) represent confirming responses by users that indicated *browsing* as defined in this study. Others examples of *browsing* show users explicitly telling the librarian that they can see a lot of numbers, the library's home page, or that they can see some other text displayed on the Web site:

- *I see alot of numbers and not sure which to use.*
- *i see the library's home page.*
- *i see it says it's sent, but nothing p oppped up.*

Although there is a large frequency count for sessions involving librarians and *browsing* as previously discussed above, in such sessions librarians were concerned essentially about whether users could see the Web page sent to them and whether they could see the content on the Web page.

As a result of *browsing* and the librarian's concern as to whether users could see specific content pushed to them, users may have sometimes viewed or co-browsed the same content, though not necessarily as a result of desktop sharing *co-browsing/escorting*. However, the implementation of *co-browsing/escorting* features entailed co-browsing as the result of participants sharing their desktops. Librarians generally initiated such desktop sharing related co-browsing, which is seen in 42% (145) of these sessions. Typically, desktop sharing related *co-browsing/escorting* was used to demonstrate or instruct users in searching databases and the OPAC. Initially, this type of co-browsing was difficult to determine in transcripts; however, several patterns emerged to suggest desktop sharing *co-browsing/escorting*. One pattern involved librarians making statements such as I *will show* as outlined below:

- *I'm going to try to connect to the database and show you the screens.*
- *While we're talking, I"m going to take us into BIOSIS and try some searches. let me show you*

- *OK, what I'm going to do is show you the database and how to search it. Hold on one second....*

A second pattern indicative of desktop sharing *co-browsing/escorting* involved librarians making this type of *scripted* statement: *As I go to different web sites, your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an "item sent" message in the chat box. Ready?* Sometimes when librarians did not use this script, they asked or told users about their screen changing after they sent a Web page, which was a third indicator of *co-browsing/escorting*. For example, users were told to "hold on just a moment and your page should change...." In a number of instances librarians explicitly told users that they were going to escort, co-browse, or take over their browsers. Librarians said things such as "I will need to try to take over your browser" or "I am goin I'm going to try escorting you...." Librarians also told users to watch what they did or watch their arrow. Librarians even told users that they could see their screens, or suggested that they "search together." To circumvent problems during co-browsing, the librarian told the user in one session, "Great, so that we don't develop a problem, please let me click and I will let you watch..."

Librarians usually followed the same pattern when confirming whether users could see pages sent via *co-browsing/escorting*. As seen in transcript #498961, after pushing a Web page to the user, the librarian followed-up by asking the user if s/he could see the page. For example, the user asked, "where's the index," which was followed by the librarian implementing *co-browsing/escorting* features, and alerting the user of what to expect (lines 8-9). The librarian also pushed two pages pertaining to databases and two pertaining to dissertations (lines 14, 16, 18-19). After pushing these pages, the librarian asked, "Do you see the search screen now?" (line 21).

1. Transcript #498961
2. STATUS: UNIV Undergraduate
3. User: Where do I look for a specific dissertation? author Maria Raquel Casas/Yale 1997
   2002-11-14 11:15:05 PT
4. [. . .]
5. User: Is there a website? for dissertations
   2002-11-14 11:22:02 PT
6. [. . .]
7. Librarian: let me show you the index...
   2002-11-14 11:24:03 PT
8. **User: Where do I find index**

2002-11-14 11:24:31 PT

9. **Librarian: As I go to to the web site , your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an "item sent" message in the chat box. Ready?**
   2002-11-14 11:25:14 PT
10. User: yes
    2002-11-14 11:26:34 PT
11. Librarian: the index is called "Digital Dissertations"...
    2002-11-14 11:26:48 PT
12. Librarian: and we can find it under "Article Databases"...
    2002-11-14 11:26:52 PT
13. Librarian: I'll click there...
    2002-11-14 11:26:59 PT
14. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases.html**
    2002-11-14 11:27:10 PT
15. Librarian: now, i'll click on "D"...
    2002-11-14 11:27:21 PT
16. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases_d.html**
    2002-11-14 11:27:32 PT
17. Librarian: and then on "Digital Dissertations"
    2002-11-14 11:27:42 PT
18. **Librarian: [Page sent] http://wwwlib.umi.com/dissertations/gateway**
    2002-11-14 11:27:52 PT
19. **Librarian: [Page sent] http://wwwlib.umi.com/dissertations/search**
    2002-11-14 11:27:55 PT
20. Librarian: and then on "Enter"
    2002-11-14 11:28:08 PT
21. **Librarian: Do you see the search screen now?**
    2002-11-14 11:28:22 PT
22. User: yes
    2002-11-14 11:28:41 PT
23. Librarian: great. i'll enter "casas" in the first box...
    2002-11-14 11:29:05 PT
24. [. . .]

Prior to implementing the *co-browsing/escorting* tools librarians seemed to prefer beginning at the library's home page. As seen below in transcript #664009, many librarians asked users if they could see the library's home page, typically prior to implementing *co-browsing/escorting* and *page pushing* tools. In this transcript session, based on the user's request for assistance in selecting a better database than ProQuest, the librarian offered to show him or her how to use the database. The user responded by saying "could you please show me?" (line 7-8, 10). Prior to sending Web pages, the librarian asked the user "OK, do you see the LIBRARY's web site on your browser?" (line 11). Also, the librarian told the user to just follow along while s/he clicked

on the *Articles database*; the librarian proceeded by pushing the Web page for the *Articles database* (line 13-15). Preceding *pushed pages*, the librarian essentially outlined what to expect (lines 14-15, 17-18, 20-21). This process of outlining a series of steps or procedures along with pushing pages is considered as *demonstration with co-browsing/escorting*. For further discussion on this topic, see below under *demonstration*.

1. Transcript #664009
2. STATUS: Univ Undergraduate
3. User: How do I access ProQuest to find journal articles online? Sorry, I accidentally navigated away from this page.
   2002-12-11 12:47:52 PT
4. [. . .]
5. Librarian: Is there a particular reason you want to search the Proquest databases? I'm not sure they will be relevant.
   2002-12-11 12:51:47 PT
6. Librarian: I think that the database Expanded Academic ASAP will do the trick for you.
   2002-12-11 12:51:55 PT
7. **User: My friend said she found most of her articles on Proquest but maybe you can assist me to a better search engine**
   2002-12-11 12:51:55 PT
8. **Librarian: I can show you. If you like.**
   2002-12-11 12:52:04 PT
9. User: great thank you
   2002-12-11 12:52:20 PT
10. **User: could you please show me?**
    2002-12-11 12:52:23 PT
11. **Librarian: OK, do you see the LIBRARY's web site on your browser?[]**
    2002-12-11 12:52:40 PT
12. User: yes
    2002-12-11 12:52:59 PT
13. **Librarian: OK, Don't until I tell you. Just follow along.**
    2002-12-11 12:53:10 PT
14. **Librarian: I'm going to click on "Article Databases"**
    2002-12-11 12:53:15 PT
15. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases.html**
    2002-12-11 12:53:17 PT
16. User: ok
    2002-12-11 12:53:32 PT
17. **Librarian: Now, I will click on "E" under "By Title"**
    2002-12-11 12:53:37 PT
18. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases_e.html**
    2002-12-11 12:53:51 PT
19. User: ok
    2002-12-11 12:54:08 PT

20. Librarian: and click on Expanded Academic ASAP
2002-12-11 12:54:11 PT
21. Librarian: [Page sent] http://www.cdlib.org/hlp/directory/eaasap.html
2002-12-11 12:54:27 PT
22. Librarian: and now [Univ name].
2002-12-11 12:54:51 PT
23. Librarian: [Page sent] http://web3.infotrac.galegroup.com/itw/[. . .]
2002-12-11 12:54:58 PT
24. Librarian: Are you follwoing me so far?
2002-12-11 12:55:04 PT
25. User: wow, very cool
2002-12-11 12:55:18 PT
26. [. . .]

Only 2% (8) of chat digital reference sessions involved users making utterances pertaining to *co-browsing* activities. These sessions consisted of users requesting librarians to show them how to search specific databases or requesting to be taken back to a particular screen. In another instance, the user told the librarian, "sorry, 'co-browsing not supported' on my computer." Other examples of users seeking search related assistance by asking librarians *to show* them are provided below:

- *Yeah if you could show me how to begin my search in biosis would be great*
- *can u also show me how to find articles in expanded academic?*

In one session, the user was not prepared for or did not anticipate what would occur on his or her screen when desktop sharing *co-browsing/escorting* was implemented. In this session, the user commented, "someone took control of my computer system."

Educational Related

A high percentage of chat digital reference sessions involved *educational related* activities such as *guidance* (86%, or 295 sessions) and *instruction* (94%, or 322 sessions). A smaller percentage of sessions involved *demonstration* (24%, or 85 sessions). *Guidance* involved the librarian navigating or directing the user through the online reference system. During such activities, librarians pointed users to various Web-based resources and services via *pushed pages* or *pasted-in URLs* (see sections above), thus educating users to the *where* and *what* about the system, its resources, and services. Other directions to users were in response to their asking how to obtain copies of books or journals in the OPAC or in specific databases. See the quotes below for examples of resources and services in which librarians *pushed pages* or *pasted-*

in URLs to navigate users through the library system. In the first set of quotes, librarians pointed users to other libraries and services on or off campus:

- *Also, you might try the undergraduate counseling office of your School....*
- *so the record shows that this is available in the Main Library at the call number specified....it's on the 4th floor and you can check it out!*
- *You might also want to try the Reference Desk at the Science Library. They can be reached at [phone number].*

Librarians pointed users to specific resources on the library's Web site, for example to databases, the OPAC, and other resources:

- *I would suggest that we start looking in LexisNexis*
- *I recommend looking in newspapers....*
- *You can look in OPAC, the Library's catalog, at: http://opac.lib.Univ.edu/*

Librarians pointed users to various shelving locations within the library, for example which floor has particular call numbers:

- *We have the issue on the 4th floor with the call number K 14 A858. YOu will need to look for volume 16 no. 38 page a19 .*
- *write down this call number .*

Instructions were educational related activities in which librarians provided explanations pertaining to the system, its resources, and services, thus giving users the *why* concerning these. Here, the librarian did more than just point but sometimes defined concepts, made value added judgments, or if-then statement concerning the system, its resources, and services. Below are quotes illustrating such findings in the data:

- *PDF will give you the article as it appears in the journal..sort of like a photocopy of the pages with charts and graphics.*
- *if you click on the [Univ] e-link and then select the [System Name] option it'll show you that it's only available at one library - [State abbreviation] state library].*
- *it's our best source for history articles... which is the great thing about this database [two lines combined].*

Demonstrations involved *educational related* activities in which the librarian typically outlined a series of steps or procedures on how to perform a search. Two patterns of *demonstrations* were seen in these chat digital reference sessions, all of which were conducted

by librarians: *demonstrations with co-browsing/escorting* (23%, or 77 sessions); and *demonstration without co-browsing/escorting* (2%, or 6 sessions). An example of *demonstrations with co-browsing/escorting* was presented above in the section on *co-browsing/escorting,* (see transcript #664009, pages 224-225). The transcript showed that in each instance prior to *page pushing* when showing the user a particular database or something else on the Web page, the librarian outlined that s/he was doing. For example, before pushing the page, the librarian told the user what s/he would be clicking on objects such as the *Article Databases,* the letter *E* under *By Title*, *Expanded Academic ASAP,* the link to the University, respectively (lines 14-15, 17-18, 20-23). In many of these *educational related* activities, the user participated by following the librarian's directives and/or by *confirming/acknowledging* responses (for example, see line 19).

Demonstration without co-browsing/escorting also involved the librarian or user showing the other objects on the Web page but without the implementation of the *co-browsing/escorting* tools. Here, participants engaged in activities such as collaborative viewing and searching of particular resources on the Web page, typically via *pasted-in URLs*. Transcript #931999 is an example of *demonstration without co-browsing/escorting*. In this session, the librarian initially started out with a *push page* to a database to show the user how to search for information on his or her topic (line 5); however, the user could not see the page (lines 8). This constraint was resolved by the librarian sending the user *pasted-in URLs* (lines 9, 11). Hence, the *demonstration* began when the librarian sent the third *pasted-in URL* for the library home page (line 15). After sending the third URL, the user was given a series of directives such as select *Articles Databases*, scroll to *Expanded Academic*, and select the University, use advanced search respectively (lines 15, 17, 19-20).

1. Transcript #931999
2. STATUS: UNIV Undergraduate
3. User: i want to research information about age of consent for my writing 39C research. My topic is should juveniles be prosecuted as adults. Since some states can prosecute juveniles as young as 13 as adults i want to find information about age of consent. Legal age which is 18 that we are declared as independent
   2003-01-14 13:44:45 PT
4. [. . .]
5. **Librarian: [Page sent] http://course.lib.univ.edu/hu/writing/w03/**
   2003-01-14 13:51:09 PT
6. User: ok
   2003-01-14 13:51:16 PT

7. Librarian: Let me know if you can see that....
   2003-01-14 13:51:57 PT
8. **User: nope**
   2003-01-14 13:52:36 PT
9. **Librarian: OK, the URL is: http://course.lib.univ.edu/hu/writing/w03/**
   2003-01-14 13:53:13 PT
10. User: thanks
    2003-01-14 13:53:22 PT
11. **Librarian: Also you can search in Opac (http://opac.lib.univ.edu/), our UNIV online catalog**
    2003-01-14 13:54:05 PT
12. Librarian: try keyword searching on terms like "age of consent" and the other terms that you've given here...
    2003-01-14 13:54:23 PT
13. Librarian: The other database you'll learn about in class is Expanded Academic...
    2003-01-14 13:54:38 PT
14. User: ok thanks
    2003-01-14 13:54:55 PT
15. **Librarian: to get to that: go to UNIV Libraries homepage (http://www.lib.univ.edu/) and select "Article Databases" at the top**
    2003-01-14 13:55:28 PT
16. User: and then
    2003-01-14 13:55:45 PT
17. **Librarian: then select "E" and scroll to Expanded Academic at the bottom of the list**
    2003-01-14 13:56:33 PT
18. **User: uh huh**
    2003-01-14 13:56:40 PT
19. **Librarian: ...select "[Univ name]" and then you're in..you can search there on keywords and subject headings**
    2003-01-14 13:57:12 PT
20. **Librarian: use the advanced search feature for more options**
    2003-01-14 13:57:58 PT
21. Librarian: you should be able to get started that way...how soon is your assignment due?
    2003-01-14 13:58:11 PT
22. [. . .]

Thirty-two percent (111) of these sessions involved *educational related* activities that could not be determined.

Psychological.

Participants interacting in the chat digital reference environment made a number of psychological statements, which provided insight into their experiences in this environment. There were two major dimensions comprising *psychological* states: *affective states* and *RUSA*

behavior. The most prevalent *affective states* displayed by users in transcript sessions included *gratitude*. This attitude was displayed most often by users saying *thanks* and *thank you* in 89% (305) of the sessions and displayed by librarians in only 26% (94) of the total chat digital reference sessions represented in this study. These expressions of *gratitude* were found most often near the end of sessions. Librarians reciprocated these expressions with *welcome, non-greeting* in only 25% (87) of the sessions.

Users acknowledged *successes* in meeting their needs or aspects of their needs in 24% (83) of chat digital reference sessions. After receiving answers to search retrievals, in instances of *successes* users made utterances such as *perfect*; *just what I need*; *I think I should be able to go from here*; and related utterances. Sometimes users indicated *successes* when responding to librarian follow-up questions "can I help you with anything else?" In such instances users said, *no that is it*; *that is all; That's more than enough*; and other related utterances.

Both the user and the librarian *supported and encouraged* one another, with the user doing so in only 10% (34) of the sessions and the librarian doing so in 30% (101) of the sessions. Usually a participant exhibited this type of statement in response to the other participant's apologies for some inconvenience or mistake.

1. Transcript #236695
2. STATUS: UNIV Undergraduate
3. User: Hi, I was wondering how to check out a video in the reserves section. I checked online but it was not listed, but my teacher assured us it is there for us to rent. Is there another way of finding this video?
   2004-05-18 13:51:58 PT
4. Computer response: A librarian will be with you in about a minute.
   2004-05-18 13:52:16 PT
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2004-05-18 13:52:44 PT
6. [. . .]
7. **Librarian: sorry, i skipped steps**
   2004-05-18 13:58:49 PT
8. Librarian: [Page sent - OPAC NAME Web/Univ Libraries Public Access Catalog] http://OPAC Name.lib.univ.edu/search/
   2004-05-18 13:58:53 PT
9. **User: its ok**
   2004-05-18 13:59:01 PT
10. Librarian: from our OPAC Name page here, click on title
    2004-05-18 13:59:04 PT
11. User: i guess its not showing up?

2004-05-18 13:59:09 PT

12. [. . .]

Transcript #236695, above, is an example of the user engaged in making supportive statements. Following the librarian apologizing for skipping steps, presumably in her search of the OPAC (lines 7), the user said, "its ok" (line 9). The user in the session for transcript #77678, below, also exhibited a similar type of supportive statement. Here the librarian apologized for losing the user in a previous session (line 6), and the user said, "Don't worry. I think my computer was acting up" (line 8).

1. Transcript #77678
2. Status: UNIV Undergraduate
3. User: I am trying to find articles to answer Why do Asian Americans attatin higher education than other minorities?
   2003-10-13 11:15:06 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-10-13 11:15:16 PT
5. [. . .]
6. **Librarian: I'm sorry that I lost you last time.**
   2003-10-13 11:15:57 PT
7. Librarian: Have you try searching ERIC?
   2003-10-13 11:16:00 PT
8. **User: Don't worry. I think my computer was acting up.**
   2003-10-13 11:16:10 PT
9. [. . .]

In their supportive statements, most often users were seen saying *no problem*. As seen in transcript #51333 below the librarian apologized for the delayed service (line 12), and the user commented ". . . No problem, please take your time" (line 13):

1. Transcript #515333
2. STATUS: UNIV Undergraduate
3. User: Hi. I want to write an essay on the voer turnout in the very recent 2002
4. California elecions. For this I want to find aricles containing information about
5. what the turn out was. Also I need information articles about what measures were
6. on the ballot or is
   2002-11-20 15:59:52 PT
7. Computer response: A librarian will be with you in about a minute.
   2002-11-20 16:00:15 PT
8. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
   2002-11-20 16:01:13 PT
9. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
   2002-11-20 16:01:52 PT

10. User: i. Please, go ahead
    2002-11-20 16:04:23 PT
11. User: I am mainly looking for newspaper aricles. Am I right in assuming that that is the best avenue?
    2002-11-20 16:04:29 PT
12. **Librarian: Sorry for the delay. I'll be with you as soon as possible.**
    2002-11-20 16:05:51 PT
13. **User:** I ask you since I do not know how to look for this type of information quickly, without going through acual piles of newspapers and microfiche. **No problem, please take your time.**
    2002-11-20 16:09:19 PT
14. [. . .]

Although librarians' supportive attitudes sometimes also consisted of saying *no problem*, they most often responded by wishing the user *good luck* on his or her project/assignment. As depicted in transcript #997644 (line 8), below, the librarian exhibited a supportive attitude by wishing the user "Good luck" at the end of the session:

1. Transcript #997644
2. STATUS: UNIV Graduate
3. User: I'm trying to find old(late 1800's, early 1900's) newspaper reviews of theatre artists Edward Gordon Craig and Adolphe Appia. Most likely the reviews would be in British papers. Any ideas on where to start? Thanks!
   2003-01-27 14:12:11 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-01-27 14:12:23 PT
5. [. . .]
6. **Librarian: Is there anything else I can help you with today?**
   2003-01-27 14:50:20 PT
7. User: I think you've covered all of my options. That's it. Thanks!
   2003-01-27 14:51:00 PT
8. **Librarian: Good luck. Now if I have time i will have to look lthose guys up. Bye**
   2003-01-27 14:51:21 PT
9. Computer response: [patron - has disconnected]
   2003-01-27 18:12:33 PT
10. [. . .]

In transcript #1132691, the librarian not only wished the user *good luck*, s/he also encouraged the user to come back if s/he had additional questions (lines 9-10). As seen in the following discussions, the encouragement to come back (follow-up) is also considered to be a RUSA *follow-up* behavior.

1. Transcript #1132691
2. STATUS: UNIV Undergraduate
3. User: How do I find articles about the effect of different wavelengths on

photosynthesis?
2003-02-13 15:50:05 PT

4. Computer response: A librarian will be with you in about a minute.
   2003-02-13 15:50:14 PT
5. [. . .]
6. Librarian: Now, see what you think about these 26 articles.
   2003-02-13 16:03:57 PT
7. Librarian: I'll leave you alone to browse.
   2003-02-13 16:04:20 PT
8. User: Thanks for your help, I found some stuff I can use
   2003-02-13 16:04:37 PT
9. **Librarian: Great! Good luck with your research.**
   2003-02-13 16:04:48 PT
10. **Librarian: Come back if you have more questions.**
    2003-02-13 16:05:02 PT
11. User: [Page sent] http://gateway2.ovid.com:80/ovidweb.cgi
    2003-02-13 16:05:13 PT
12. User: [Page sent] http://gateway2.ovid.com:80/ovidweb.cgi
    2003-02-13 16:05:59 PT
13. Computer response: [patron - has disconnected]
    2003-02-13 16:13:45 PT
14. [. . .]

Both users and librarians expressed *likes* about aspects of the chat digital reference interaction or the chat digital reference service itself. For example, in 15% (51) of the sessions users expressed *likes* about aspects of the service, while in 16% (54) of these sessions librarians expressed *likes* about aspects of the service. A few users in sessions expressed liking the chat digital reference service. They said such things as “dang i have to say this live chat thing is a great idea hah” ; “I love this service! It is definitely necessary”; “this library chat thing is pretty cool.” Neither user nor librarian expressed much *dislike* regarding the digital reference system or its resources and services. For example, in only 3% (10) of these sessions, users expressed *dislikes* about the service, while in only 2% (7) of these sessions librarians expressed *dislikes* about the service.

A sizable number of librarians expressed statements of *readiness* in digital reference sessions. In 45% (155) of these sessions, chat librarians expressed *readiness*, while in 16% (54) of these sessions users expressed *readiness*. Thus, librarians made such statements in more than twice as many sessions as users. These statements were expressed by librarians as a *readiness to interact* and were expressed in two forms. The librarian expressed one form of *readiness to*

interact by asking the user whether s/he was *ready to proceed* with the interaction as seen below in examples of quotes from transcripts:

- *Let me know when you're ready for the next step.*
- *Ready?*
- *Are you ready for me to escort you?*

The librarian expressed the second form of *readiness* by asking users to *wait or hold* on. Most commonly this was done when the librarian conducted a search. The librarian also asked users to hold on in order to: explain; implement co-browsing/escorting feature; watch for changes in the Web page (computer screen); finish with another caller (connected user) or to hold on while some other activity was being performed. Thus, *readiness* to interact was either asking the user to *wait* or *hold* or asking the user *are they ready to proceed* with the interaction. These two types of *readiness* were strategies employed by librarians as a way of pacing the interaction. Below are examples of quotes from librarians exhibiting this second pattern of *readiness* in digital reference sessions:

- *Wait, wait....let me explain what we need to do*
- *I'm helping another user at the moment - I'll be just a minute, I think, if you don't mind waiting. Otherwise, feel free to try back in 10 or 15 minutes.*
- *OK, hold on one second...*

In another example of *readiness*, specifically *readiness to interact*, the user tried to pace the interaction by telling the librarian to hold on, later more explicitly to *stop talking*. This is seen in transcript #173868, where the user said "I can't go to the web site unless we stop talking for a second, so hold on..." The librarian continued to dialogue and the user again said "Stop talking for a second please" (lines 9, 16). Following the user's last request, the librarian said "sure" (line 18). The user said "Never mind...I can't change web sites when this dialogue is on, I guess" (line 19). The librarian's solution to this user's problem was for him or her to "open a second browser window" (line 20). Apparently, this user experienced difficulty going to other Web sites himself or herself while collaborative features were on and while receiving *pushed pages* from the librarian.

1. TranscriPT #173868
2. STATUS: UNIV Graduate
3. User: I'm trying to access an article from my home, and it wants a password...? 2004-03- 2 17:53:41 PT

4. Computer response
5. A librarian will be with you in about a minute.
6. [. . .]
7. Librarian: I lost your previous call somehow
   2004-03- 2 17:54:15 PT
8. [. . .]
9. **User: I can't go to the web site unless we stop talking for a second, so hold on...**
   2004-03- 2 17:59:07 PT
10. Librarian: once you have installed the software, you will run it first when you want to access the online journals, etc.
    2004-03- 2 17:59:19 PT
11. Librarian: and THEN open your browser.
    2004-03- 2 17:59:24 PT
12. Librarian: VPN first, then Browser.
    2004-03- 2 17:59:34 PT
13. Librarian: it works very well.
    2004-03- 2 17:59:38 PT
14. Librarian: I use it myself
    2004-03- 2 17:59:56 PT
15. Librarian: If you havbe problems installing it
    2004-03- 2 17:59:57 PT
16. **User: Stop talking for a second please.[]**
    2004-03- 2 18:00:04 PT
17. Librarian: call [phone number] 24/7
    2004-03- 2 18:00:07 PT
18. **Librarian: sure**
    2004-03- 2 18:00:36 PT
19. **User: Never mind...I can't change web sites when this dialogue is on, I guess.**
    2004-03- 2 18:01:02 PT
20. **Librarian: open a second browser window**
    2004-03- 2 18:01:13 PT
21. User: Okay.
    2004-03- 2 18:02:41 PT
22. User: So, what do I click on?
    2004-03- 2 18:02:58 PT
23. User: It says that VPN slows my connection though...
    2004-03- 2 18:03:01 PT
24. [. . .]

Many instances of user *readiness* were displayed in sessions as an *immediacy of need* or as some *other time factor*. *Readiness as immediacy of need* generally involved students referencing the time factor for their need. For example, students asked how long it would take to get information, or they stated when they wanted to have the information as seen below in quotes from transcript sessions:

- *how long will it take until i get the article.*
- *do u know about how long that will take?* [article via database service].
- *my god....I need it now...for my paper I am crunched for time because it is midterms! A very crazy time!*

Other readiness related *time factors* involved users indicating they had to leave or saying they had class at some specified time. Such *time factors* are represented in quotes below from transcript sessions:

- *I have a class at 4, can you please email me some information as soon as possible*
- *and also unfortunately i have to run to class*
- *i have class in a few mins.*

Transcript #220199 shows the user trying to pace the interaction by asking the librarian to wait. Note the librarian asked the user the typical *follow-up* question "can I help you with anything else?" The user answered "no" and said "thank you" (lines 18-20). Thus, the two appeared to go through the closing ritual and appeared ready to disconnect from the session prior to the user asking the librarian to *wait* (line 22-23). Apparently, the librarian answered the *need change* "how do you set up the proxy" (line 8) by pushing pages to the user and by providing instructions for setting up the proxy server. Thus, the user was attempting to keep the librarian online longer to answer his or her original need concerning InfoTrac (line 3) when the user asked the librarian to wait (line 23, 25).

1. Transcript #220199
2. STATUS: UNIV Undergraduate
3. **User: I can't access infotrac**
   2004-04-28 13:16:21 PT
4. Computer response: librarian will be with you in about a minute.
   2004-04-28 13:16:37 PT
5. [. . .]
6. Librarian: 1) set up proxy access in your internet browser
   2004-04-28 13:18:29 PT
7. Librarian: 2) Use the Virtual Private Network access.
   2004-04-28 13:18:49 PT
8. **User: how do you set up the proxy**
   2004-04-28 13:18:49 PT
9. Librarian: There are 2 different ways to configure your home computer...
   2004-04-28 13:19:00 PT
10. Librarian: I'll send you the page...
    2004-04-28 13:19:07 PT
11. User: it's a setting on my browser right?

2004-04-28 13:19:08 PT
12. User: k
2004-04-28 13:19:09 PT
13. User: thanks
2004-04-28 13:19:20 PT
14. Librarian: This is the page with instructions for each different kind of browser.
2004-04-28 13:20:04 PT
15. User: [Page sent - NACS @ UNIV: Web Proxy Server Configuration [. . .]
2004-04-28 13:20:04 PT
16. Librarian: There are step-by-step insturctions.
2004-04-28 13:20:40 PT
17. [. . .]
18. Librarian: Can I help you with anything else?
2004-04-28 13:23:06 PT
19. User: no
2004-04-28 13:23:07 PT
20. User: thank you
2004-04-28 13:23:13 PT
21. [. . .]
22. Librarian: Thanks for using Ask a Librarian!
2004-04-28 13:23:44 PT
23. User: oh wait
2004-04-28 13:23:44 PT
24. User: sorry
2004-04-28 13:23:49 PT
25. User: still can't access infortrac
2004-04-28 13:23:51 PT
26. User: when i enter my lib id
2004-04-28 13:23:51 PT
27. Librarian: k
2004-04-28 13:23:53 PT
28. [. . .]

Transcript #232892 below represents another instance of *readiness* in which the user tried to pace the interaction. Although the user and librarian appeared ready to leave the session, the session proceeded with both participants continuing to interact rather than log off (lines 8, 11-12). That is, participants continued to interact: the librarian recommended resources; and the user clicked on links in the OPAC (lines 13-14, 16-17). After the user received additional recommendations from the librarian and accessed the resources in the OPAC, the librarian asked a *follow-up* question, “do you have other questions for now or would you like to go explore those resources?” (line 22). To this follow-up question, the user answered, “i think i'm fine for now for this question and i don't have any other questions right now”(line 23). However, the user

changed his or her mind and tried to pace the interaction by asking the librarian to wait (line 24). The user's new question (line 26) represented a shift in the original information need (line 3) or represented a *need change*.

1. Transcript #232892
2. STATUS: Writing 39C Student
3. **User: What are free market think tanks? Are they biased groups?**
   2004-05-13 12:38:32 PT
4. Computer response: librarian will be with you in about a minute.
   2004-05-13 12:38:37 PT
5. [. . .]
6. Librarian: OK, but i am not an expert on think thanks either....
   2004-05-13 12:47:56 PT
7. Librarian: you should probably look at more websites and maybe encyclopedia definitions....don't take it from me!
   2004-05-13 12:47:57 PT
8. **User: ok. thanks for your time an help**
   2004-05-13 12:48:11 PT
9. User: ok
   2004-05-13 12:48:13 PT
10. User: thank you
    2004-05-13 12:48:42 PT
11. **Librarian: sounds like you've got a good start**
    2004-05-13 12:49:09 PT
12. **User: yes i do**
    2004-05-13 12:49:25 PT
13. **Librarian: also try....search in OPAC Name on keyword "think tanks"**
    2004-05-13 12:49:44 PT
14. **Librarian: ...a number of books come up (just to skim)....**
    2004-05-13 12:50:23 PT
15. User: ok
    2004-05-13 12:50:33 PT
16. **Librarian: you could also look it up in Expanded Academic and search on "think tanks" and "bias" or similar terms....see what you find....**
    2004-05-13 12:50:37 PT
17. **User: [Page sent - OPAC NAME Web/Univ Libraries Public Access Catalog] http://OPAC Name.lib.univ.edu/**
    2004-05-13 12:50:39 PT
18. [. . .]
19. Librarian: ....just sent you a page on our website with encyclopedias....
    2004-05-13 12:51:29 PT
20. User: ok
    2004-05-13 12:52:42 PT
21. [. . .]
22. **Librarian: do you have other questions for now or would you like to go explore those resources?**

2004-05-13 12:53:35 PT

23. User: i think i'm fine for now for this question and i don't have any other questions right now
2004-05-13 12:54:32 PT

24. User: oh wait one more question
2004-05-13 12:54:42 PT

25. Librarian: ok,...
2004-05-13 12:55:06 PT

26. User: so can you tell me exactly what would make an organization be biased?
2004-05-13 12:55:50 PT

27. Librarian: as i said before, it's relative and not always clearcut...
2004-05-13 12:56:30 PT

28. [. . .]

In some other transcripts users indicated that they would wait for the librarian. In transcript #187258, the librarian indicated that s/he was assisting more than one user online during that session (line 8). Thus, the user said "I'm here at the library and I signed in and it brought up a screen. I typed in my regular passcode and it didn't work...I'll wait for you..." (line 9). Thus, the user showed a cooperative nature by continuing to wait for the librarian in the session.

1. Transcript #187258

2. STATUS: UNIV Graduate

3. User: Hi there. I'm trying to access Congressional Roll Call and Congressional Observer Publication but it wants a passcode - do we have a subscription? If not how may I view Congressional votes? thanks
2004-03-17 15:17:29 PT

4. Computer response: librarian will be with you in about a minute.
2004-03-17 15:18:10 PT

5. [. . .]

6. Librarian: [Person name]: If you are a UNIV student, you need to follow th login instruction
2004-03-17 15:20:52 PT

7. User: [Page sent - Computing in the Libraries (Univ Libraries)] http://www.lib.univ.edu/services/computers.html
2004-03-17 15:21:12 PT

8. Librarian: I am helping TWO of you right now, so, please hold on
2004-03-17 15:21:30 PT

9. User: I'm here at the library and I signed in and it brought up a screen. I typed in my regular passcode and it didn't work...I'll wait for you...
2004-03-17 15:23:24 PT

10. User: [Page sent - Home Page (Univ Libraries)] http://www.lib.univ.edu/
2004-03-17 15:23:29 PT

11. User: [Page sent - Subject Guides (Univ Libraries)] http://www.lib.univ.edu/online/subject/subject.html

2004-03-17 15:23:47 PT

12. User: [Page sent - Political Science Resources (Univ Libraries)]
http://www.lib.univ.edu/online/subject/poli.html
2004-03-17 15:23:53 PT

13. [. . .]

As previously discussed, librarians *apologized* in more sessions than users. Librarians were observed apologizing almost twice as much as users, doing so in 22% (76) of sessions, while users *apologized* in 12% (40) of sessions.

In addition to the previously discussed dimensions, a small number of transcript sessions included four *other* dimensions. One, participants corrected their own mistakes (*corrects self*). In 2% (7) of these sessions users exhibited c*orrects self*, while in 4% (14) of the sessions librarians exhibited *corrects self*. Two, users and librarians repeated themselves or each other (*repetition*). In 4% (15) of these sessions, users displayed *repetition*, while in 4% (15) of these sessions librarians displayed *repetition*. In three, 3% of the sessions, users indicated that they were returning users. Four, 8% (26) of digital reference sessions represented user *expectations*.

Sixty-nine percent (256) of all chat digital reference sessions displayed *RUSA behaviors* (modified version). Librarians demonstrated *approachability* in 79% (270) of the sessions; *follow-up* in 54% (184); *searching* in 57% (194); *interest - formality pacing* in 63% (214); and *Interest - other* in 93% (317). The large proportion of *Interest – other* is due to the incorporation of *reference interviews,* and *listening* (general interest) in this category. Examples of these are as follows:

- *Follow-up* - Page 124-125, transcript #1132691 (line 10) and page 128-129, transcript #220199 (line 18);
- *Searching* – Page 225-226, transcript #931999 (line 15, 17, 19-20);
- *Interest* – formality pacing – Page 126 (quotes);
- *Interest* – other - Page 97-98, transcript #10009 (lines 6, 10, 16, 20, 22); and
- *Approachability* - Pages 91-92 (*opening greetings*).

Barriers.

Over half of the chat digital reference sessions were constrained by different types of *barriers*, for example *forgetfulness, technological related, searching,* and *access/availability*. These were identified typically by user and librarian utterances, by URL *page sent* and embedded words or words preceding the *page sent* and *item sent* labels.

Of the different types of *barriers*, *technological* comprised the largest number. Overall, in 30% (103) of chat digital reference sessions, users reported *barriers, technological,* while in 27% (93) of these sessions librarians reported *barriers, technological.* The following categories comprised these types of *barriers: navigation and viewing; disconnect, error, and freezing; software and computer; time factor, printing,* and other types of *technological barriers.*

Navigation and viewing comprised the largest category of *technological barriers*. In 12% (42) of these chat digital reference sessions, users reported *navigation and viewing* types of barriers, while in 7% (25) of these sessions librarians reported *navigation and viewing* types of problems. These typically included problems receiving Web pages, opening links, and viewing Web pages. Examples are listed below of quotes from transcript sessions representing *navigation and viewing* type of constraints to the digital reference process:

- *I see the [Univ name] e-links page you opened but not the [system name] page.*
- *there is no display when i click on it, its just a blank page .*
- *Is it not working? My screen is not changing ... .*

The number of *disconnections*, *errors and freezing* was close to the number of *navigation and viewing technological barriers.* In 11% (36) of chat digital reference sessions, users reported *disconnections, errors and freezing* types of barriers, while in 9% (30) of these sessions librarians reported *disconnections, errors and freezing* types of barriers. As seen above in transcripts #145594 (lines 8, 10, 12-13, see pages 107), sometimes *error* messages preceded URLs or were part of the URLs themselves.

Sessions with *disconnection technological barriers* sometimes indicated that librarians were unaware that users had disconnected and reconnected to the digital reference service. Transcript #1374252 below is an example of such *disconnections*. When the user rejoined the session, the librarian proceeded as though there had been no interruption in the session (lines 3-7). The disruption in the session may have gone unnoticed by the librarian until the user reconnected. Additionally, there was no *information need* listed at the onset of this session, possibly because the user was continuing a transaction from a session immediately preceding this one. As this session proceeded, it became apparent, however, that the information need concerned borrowing books (lines 5-6, 9).

1. Transcript #1374252
2. STATUS: UNIV Undergraduate
3. **User: I was disconnected.**

2003-04- 8 17:46:37 PT
[. . .]

4. **Librarian: OK**
   2003-04- 8 17:47:18 PT
5. **Librarian: Anyway if this is the book:[]**
   2003-04- 8 17:47:21 PT
6. **Librarian: Top-Down Network Design by Priscilla Oppenheimer**
   2003-04- 8 17:47:43 PT
7. **Librarian: UNIV does not have a copy and I can't find a copy in the UNIV system...**
   2003-04- 8 17:48:03 PT
8. Librarian: You could borrow it from somewhere else but it might take several weeks
   2003-04- 8 17:48:16 PT
9. **User: How can I borrow this book?**
   2003-04- 8 17:48:43 PT
10. Librarian: You can use "interlibrary loan" See if this page comes through for you:
    2003-04- 8 17:49:06 PT
11. Librarian: [Page sent] http://Opac.lib.Univ.edu/screens/ill.html
    2003-04- 8 17:49:49 PT
12. User: [Page sent] http://Opac.lib.Univ.edu/illb
    2003-04- 8 17:50:10 PT
13. Librarian: You can fill out information about the item and then send your request.
    2003-04- 8 17:50:25 PT
14. Librarian: Thanks for coming back. Is there anything else?
    2003-04- 8 17:50:29 PT
15. User: OK I'm trying to use it, thank you very very much ^_^
    2003-04- 8 17:50:57 PT
16. Librarian: Bye
    2003-04- 8 17:51:08 PT
17. User: Bye
    2003-04- 8 17:51:28 PT
18. Computer response: [patron - has disconnected]
    2003-04- 8 17:51:31 PT
19. Librarian: Click on the END CALL button at the bottom of your chat screen. We will be disconnected and you will then see the URLs (web addresses) of the sites we visited. You can click on any of them to get back to those pages, or click on your browser's print button to print out the list of URLs.
    2003-04- 8 17:51:50 PT
20. Librarian: note to staff: COMP-Hold
    2003-04- 8 17:51:51 PT
21. Computer response: [librarian - user has closed this session]

It should be noted that this researcher also experienced a similar type of disconnection and reconnection *barrier* while interviewing one of the online chat interviewees for this study. Mary disconnected from the session without the researcher noticing it. The researcher realized that the

user had disconnected only after Mary reconnected to the interview session and after the messages appeared on the computer screen "*Mary leaves*" and "*Mary enters.*" Thus, when an online participant had a momentary disconnection-reconnection, the rapidness in which the event occurs can make it unnoticeable to the remaining participant.

Constraints involving *software and computer* consisted of the lack of computer and software related functions. In 6% (22) of chat digital reference sessions, users reported *software and computer* types of barriers, while 10% (35) of these sessions librarians reported *software and computer* types of barriers. Examples of these types of *technological barriers* are given below in quotes from transcripts:

- *sorry, the E key on this lab computer sometimes doesnt work .*
- *I was using netscape and that never seems to work with this.*
- *sorry, "co-browsing not supported" on my computer .*

Librarians in chat digital reference sessions pointed out *software and computer* related constraints pertaining to the proxy server, *co-browsing/escorting*, and related *barriers*. The following quotes represent examples of such *barriers* identified by librarians during digital reference sessions:

- *hmm. . . somehow, your proxy is not configured correctly .*
- *unfortunately, the escort feature is not going to work .*
- *If you are at a company you will have problems with the firewalls. .*

Finally, A negligible number of chat digital reference sessions included at least *time factor*, *printing*, and *other technological barriers*. The proportion of these type barriers are negligible, as seen in table 3.

Table 3: Barriers and need resolution as count and percent of chat digital reference sessions incorporating collaborative tools; N = 342 transcript sessions.

CODE	TRANSCRIPTS CODED (NUMBER AND PERCENT)			
	USER		LIBRARIAN	
BARRIER				
Barrier - Forgetfulness	18	5%	14	4%
Technology - Disconnect, Error, Freezing	36	11%	29	8%
Technology - Software, Computer	22	6%	37	11%
Technology - Navigation, Viewing	42	12%	28	8%
Technology - Time Factor	1	n/a	3	n/a
Technology - Printing	1	n/a	0	n/a
Technology - Other	1	n/a	12	4%
Barrier - Searching	74	22%	11	4%
Barrier - Access, Availability	24	7%	29	8%
Can't Determine	26	8%	37	11%
NEED RESOLUTION				
Resolved	154	45%	135	39%
Referral	0	n/a	114	33%
Unresolved	28	8%	26	8%
Can't Determine	27	8%	0	n/a

Searching was the other type of *barrier* occurring during digital reference sessions. In 22% (74) of the chat digital reference sessions, users reported *searching* types of barriers, while in 13% (44) of these sessions librarians reported *searching* types of barriers. In many of these sessions such *barriers* occurred while participants were individually conducting searches. Sessions with *searching* related *barriers* involving users generally showed that they had difficulties finding information matching their *information need.* See the quotes below from transcripts for examples of this type of barrier:

1. *I tried this afternoon to find books but cannot find any really directly related to what i want*
2. *But I have access to databases to search and have not found current journal addressing the basics of these theories.*
3. *because i tried searching through Opac with keywords but they didn't have any books with the keywords that i entered*

As seen in transcript #150724 below, librarians sometimes pointed out searching related *barriers*. The user in the transcript was searching for articles from *Journal of the Electrochemical Society* (line 3). However the user was having difficulty going back to previous search screens and was leaving out words in the journal title during his or her search (lines 5-9, 13). The librarian proposed taking control of the user's browser; told the user to "click on journal/title"; and pushed the page for the Web page for the OPAC (lines 10-12). This allowed the librarian to escort the user to the desired pages where the user typed in the title of the journal (lines 14-17). Afterwards the librarian questioned the accuracy of what the user typed and eventually pointed out that the problem with the search was that the user left out the article "the" in the title of the journal (lines 21, 24). This omission by the user is seen in the URL following the word *SEARCH* (line 17).

1. Transcript #150724
2. STATUS: UNIV Graduate
3. **User: I am lookind for articles on two journals, there are "Electrochemical and solid-state letters" and Journal of the Electrochemical Society. The search result by [System name] shown me that there have electronic files available in UNIV, but I checked full-text journals search can not find them... what is the problems?**
   2004-02- 4 16:54:52 PT
4. [. . .]
5. **Librarian: now click on title**
   2004-02- 4 16:56:41 PT
6. **User: [Item sent - Author/Title Search] http://OPAC Name.lib.Univ.edu/search/q**
   2004-02- 4 16:57:04 PT
7. **Librarian: no, just a title search**
   2004-02- 4 16:57:14 PT
8. **Librarian: go back**
   2004-02- 4 16:57:28 PT
9. **User: [Item sent - http://OPAC Name.lib.Univ.edu/search/q] http://OPAC Name.lib.Univ.edu/search/q**
   2004-02- 4 16:57:40 PT
10. **Librarian: hold on, let me take over**
    2004-02- 4 16:57:58 PT
11. **Librarian: okay, from here, click on title/journal title**
    2004-02- 4 16:58:03 PT
12. **Librarian: [Item sent - OPAC NAME Web/Univ Libraries Public Access Catalog] http://OPAC Name.lib.Univ.edu/**
    2004-02- 4 16:58:05 PT
13. **User: I can not go back**
    2004-02- 4 16:58:16 PT
14. **Librarian: [Item sent - OPAC NAME Web/Univ Libraries Public Access Catalog]**

http://OPAC Name.lib.Univ.edu/
2004-02- 4 16:58:27 PT

15. **User: [Item sent - Title Search] http://OPAC Name.lib.Univ.edu/search/t**
    2004-02- 4 16:58:39 PT
16. **Librarian: okay, put in the title of the journal**
    2004-02- 4 16:58:45 PT
17. **User: [Item sent - University /All Locations] http://OPAC Name.lib.Univ.edu/search/t?SEARCH=Journal+of+electrochemical+society**
    2004-02- 4 16:59:10 PT
18. Librarian: is that the exact name of the journal?
    2004-02- 4 16:59:20 PT
19. User: [Item sent - University /All Locations] http://OPAC Name.lib.Univ.edu/search/a?a
    2004-02- 4 16:59:50 PT
20. User: Journal of the Electrochemical Society
    2004-02- 4 16:59:54 PT
21. Librarian: did you mistype the journ□al title?
    2004-02- 4 17:00:06 PT
22. User: no
    2004-02- 4 17:00:25 PT
23. Librarian: okay, you left out "the" in the first search
    2004-02- 4 17:00:25 PT
24. User: [Item sent - Keyword Search] http://OPAC Name.lib.Univ.edu/search/a?a
    2004-02- 4 17:00:38 PT
25. Librarian: let me take over[]
    2004-02- 4 17:00:43 PT
26. [. . .]

Finally, *access/availability* comprised a small number of *barriers*. In 7% (24) of the chat digital reference sessions, users reported *access/availability* types of barriers, while in 8% (28) of these sessions librarians reported *access/availability* types of barriers. Participants generally experienced two types of *access/availability* type problems: 1) those related to login or related to specific Web page or database *access*; and 2) those related to the *availability* of documents once found. Quotes below indicate that users sometimes experienced difficulty with logging on and trying to *access* the digital reference service itself, or users experienced difficulty in trying to access specific Web pages, databases, and the like:

- *Yes, but I cant seem to access the logon page. Is this material available electronicall yet?*
- *still can't access infortrac*
- *when i click on the user agreement, i get taken to a page that says "access forbidden"*

In addition to *access* related *barriers*, sometimes when users and librarians retrieved information to meet user needs, they found that documents were not *available* in the library system for users to obtain actual copies of articles, books, and the like. This type of *barrier* is seen in the following quotes from transcripts.

- *UNIV does not have a copy and I can't find a copy in the UNIV system.. UNIV does not have a copy and I can't find a copy in the UNIV system..*
- *This title Psychiatric annals is not available electronically*
- *but you are right that for now it doesn't seem to be available online and we don't have a print subscriPTion...*

Finally a limited number of barriers caused by *forgetfulness and mistakes* impeded the digital reference process. In 5% (18) of chat digital reference sessions, users reported *forgetfulness and mistakes* types of barriers, while in 4% (14) of these session librarians reported *forgetfulness and mistakes* types of barriers.

Excerpts from transcripts below provide examples of such *barriers* in which participants explicitly indicated making mistakes:

- *um, I'm lost heh, I think I clicked on something else by mistake*
- *Oh - nature not natural - hang on :)....*
- *ooops...wrong thing...*
- *I got lost. I get a page asking me a password.*

In other instances, participants *forgot* certain information which may have been useful in meeting the *information need*. This type of barrier is represented below in quotes from transcripts.

- *there is a search engine for locating journal articles but i don't remember the address*
- *Was it in Proxies? I don't remember how it worked*
- *but I forget my password.*

Need Resolution.

Need resolution is the final category in this section of the results representing various user dimensions. Most often utterances by users and a few by librarians were used to determine whether needs were resolved or not. Needs were coded either as *resolved, unresolved, referred*, or *can't determine*. In 43% (148) of chat digital reference sessions, user indicated that their needs were *resolved,* while in 15% (50) of the sessions, librarians indicated that user needs were *resolved*. Users generally indicated whether their needs were met by responding "yes' to

librarian *follow-up* questions, for example, "does this answer your questions" and the like. The following quotes from transcript sessions also illustrate various ways in which users indicated that their needs were met:

- *I found some stuff I can use*
- *#11 is perfect*
- *i think i'm fine for now for this question and i don't have any other questions right now*
- *All right. That answers my question.*

Librarians sometimes made comments which indicated user needs were answered. An example of this type of *need resolution* is seen below in transcript #1414559. Here the user wanted to know how to access a database from off-campus (line 3). The librarian answered this rather focused need, essentially without conducting a reference interview. The librarian further told the user to configure his or her browser for the library's proxy server and that the login password was his or her e-mail address (line 6). Additionally, the librarian pushed the Web page containing instructions for setting up the proxy server for the user (line 7-8). The librarian sent the Web page again as the user requested (lines 12-14). Additionally, the librarian commented "COMP-Access" in a note to staff, meaning that the access related need was completed (line 16).[26] Although the librarian's *note* indicated that s/he believed that the user need was met, to be sure, such determinations must come from the user himself or herself.

1. Transcript #1414559
2. STATUS: UNIV Undergraduate
3. **User: How do I get access to a database if I'm off-campus and it's asking for a password?**
   2003-04-17 15:15:54 PT
4. Computer response: A librarian will be with you in about 2 minutes.
   2003-04-17 15:16:07 PT
5. [. . .]
6. **Librarian: Hi.you'll need to activate your UNIVNetID and configure your browser to the proxy server if you haven't already....the login/password should be your UNIVnetID (usually same as email address)**
   2003-04-17 15:18:01 PT
7. **Librarian: [Page sent] http://www.lib.Univ.edu/services/how/connect.html**
   2003-04-17 15:18:19 PT
8. **Librarian: ....I just pushed you a page w/instructions. can you see that?**
   2003-04-17 15:18:47 PT

[26] Chat digital reference librarians used scripts such as *Comp-Dir, Comp-Hold, Comp-Ref,* and *Comp-Access* to indicate that the digital reference session ended successfully and that users' information needs were fulfilled.

9. User: ok, I'll try that. Thanks
   2003-04-17 15:19:33 PT
10. Librarian: OK, if you have trouble, contact the [Service Name] help desk listed there or write back to us....do you have any more questions for me?[]
    2003-04-17 15:20:11 PT
11. User: no, i cant see the page
    2003-04-17 15:20:18 PT
12. **User: can you send it again?**
    2003-04-17 15:20:51 PT
13. **Librarian: [Page sent] http://www.lib.Univ.edu/services/how/connect.html**
    2003-04-17 15:21:00 PT
14. **Librarian: Sure and here's the URL: http://www.lib.Univ.edu/services/how/connect.html**
    2003-04-17 15:23:54 PT
15. Computer response: [patron - has disconnected]
    2003-04-17 15:24:48 PT
16. **Librarian: note to staff: COMP-Access**
    2003-04-17 15:24:48 PT
17. Computer response: [librarian - user has closed this session]

In 31% (105) of sessions, librarians referred users to other services and resources. As seen in quotes below from transcripts, librarians sometimes referred users to the their library's physical reference desk, other libraries, or to other librarians for further assistance in meeting the *information needs*:

- *It would be a good idea for you to work with the subject librarian for this subject, who may have more suggestions for research resources that you could use. The subject librarian for this topic is:*
- *Please try the {City Abbreviation] Public Library for thisIf you could meet me at the Reference Desk in the Main Library then we can continue our search*
- *Please try the {City Abbreviation] Public Library for this*

Sometimes users were referred to other library services such as ILL or to other campus services such as the computer help desk; see the quotes below from transcript sessions for examples of such referrals:

- *you can request a copy through ILL or the loan desk*
- *You can use "interlibrary loan" See if this page comes through for you:*
- *You may want to call the Computing Help Desk so they can walk you through it or help you set up the VPN.*

The following quotes from transcripts show that users were sometimes referred to specific resources such as databases, the OPAC, and the like:

- *The instructions for doing so are at: http://www.nacs.Univ.edu/help/proxy/*
- *One database you could try is Sociological Abstracts,*
- *you might try Lexis-Nexis Academic...*

Sometimes user needs were not met. In 7% (24) of chat digital reference sessions, users indicated their needs were *unresolved*, while in 9% (28) of these sessions librarians indicated that user needs were *unresolved*. Users whose needs were unmet prior to their leaving the session generally indicated so. When this occurred they sometimes indicated that they would come back to the digital reference service or come to the physical library for additional assistance. Quotes from transcripts below illustrate this point:

- *Can't find it, and I have to go...thanks for your help though.*
- *i'll go get it and i'll come back if it doesn't work.*
- *so i will try to come to the library in person for further assistance*

In some instances, it was necessary to read several passages in the transcript before learning that the need was not resolved; see, for example, transcript #1454302 below. The librarian in the session seemed to be unsure about whether s/he found the article relevant to the user need (lines 6, 8, 9); therefore s/he asked the user to acknowledge whether the article met his or her need. When the librarian sent the full article to the user for review, the user responded, “no, that's not the article...sorry” (lines 7,12). The user later asked, “is there any other information i can give to you?” (line 14). The librarian also asked the user to come into the library or to resubmit the question again in three minutes when another librarian who might be able to better assist him or her would be on-duty (lines 21, 23).

1. Transcript #1454302
2. STATUS: Writing 39C Student
3. User: To whom it may concern: I am searching for "May it please the court ...; the court has granted wide deference to colleges. (argument for affirmative action) F. Michael Higginbotham; Kathleen Bergin." on lexis-nexis..I cannot find it. Please assist. Thank you.
   2003-04-23 15:51:43 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-04-23 15:51:48 PT
5. [. . .]
6. **Librarian: Just trying to let you tell me if any of these are close; I cannot find it according to what you say..**

2003-04-23 16:10:42 PT

7. **User: no, none of the previous articles are close**
   2003-04-23 16:12:11 PT
8. **Librarian: I am emailing the next full article, because it may be it**
   2003-04-23 16:13:45 PT
9. **Librarian: Please let me know if that is it...**
   2003-04-23 16:14:22 PT
10. User: emailing it
    2003-04-23 16:15:27 PT
11. Librarian: yes, just did
    2003-04-23 16:15:54 PT
12. **User: no, that's not the article...sorry**
    2003-04-23 16:16:13 PT
13. Librarian: I am going to check the reference in Infotrac, in case somthing is wrong with it..
    2003-04-23 16:16:24 PT
14. **User: is there any other information i can give to you?**
    2003-04-23 16:18:27 PT
15. Librarian: Well, it seems I need to see the original source.. Did you say Infotrac? Here at UNIV we call it Expanded Academic or di you mean Legal Trac?
    2003-04-23 16:18:59 PT
16. User: [Page sent] http://www.lib.univ.edu/online/databases.html
    2003-04-23 16:19:23 PT
17. User: well from article databases > expanded academic ASAP > search University of Michigan
    2003-04-23 16:19:29 PT
18. User: [Page sent] http://www.cdlib.org/hlp/directory/eaasap.html
    2003-04-23 16:19:35 PT
19. User: [Page sent] http://web4.infotrac.galegroup.com/itw/infomark/0/1/1[. . .]
    2003-04-23 16:19:43 PT
20. User: sorry, didn't mean to send pages
    2003-04-23 16:20:02 PT
21. **Librarian: Also, I should logg off now. Try coming to the Library or sending your questio in 3 minutes, another Librarian may be able to help you.**
    2003-04-23 16:20:22 PT
22. User: ok thanks
    2003-04-23 16:20:43 PT
23. **Librarian: Sorry, I hope you seand the question through again in 3 minutes...bye, and goodluck**
    2003-04-23 16:20:45 PT
24. Computer response: [patron - has disconnected]
    2003-04-23 16:20:45 PT
25. Computer response: [patron - has disconnected]
    2003-04-23 16:20:57 PT
26. Librarian: note to staff: COMP-Dir
    2003-04-23 16:20:57 PT

27. Computer response: [librarian - user has closed this session]

In fourteen percent (46) of these chat digital reference sessions the resolution of user needs could not be determined. Transcript #933247 below illustrates an instance in which this researcher was uncertain whether the need was met or not. For example, the librarian was uncertain as to whether books were useful in meeting the user need. The librarian in the transcript recommended that they both do some browsing (line 6). The user conducted a search in the OPAC using terms such as *schools, sports, law* and *legislation* and the *U.S*. (line 9). In addition, the user conducted a few other searches in the OPAC (lines 10-16). This was followed by about nine seconds of interruption in the session before the user returned to the session, seemingly puzzled by what had occurred as indicated by the question mark (?). This was followed by uncertainty by both user and librarian. The librarian asked, "are you still there?" (lines 19), while the user just sent a question mark (?) (line 18), presumably to represent his or her uncertainty. Thus, there was uncertainty as to whether the user found the answer to his or her need while searching the OPAC.

1. Transcript #933247
2. STATUS: Writing 39C Student
3. User: If I want to research whether or not college athletes should get paid, where should I look for information?
   2003-01-15 13:37:06 PT
4. Computer response: A librarian will be with you in about a minute.
   2003-01-15 13:37:22 PT
5. [. . .]
6. **Librarian: I'm not sure those books are very helpful...let me look around while you do the same...**
   2003-01-15 13:41:49 PT
7. User: okay
   2003-01-15 13:41:52 PT
8. **Librarian: let me know if you find anything you like.**
   2003-01-15 13:41:55 PT
9. **User: [Page sent] http://opac.lib.univ.edu/search/dschool+sports/dschool+sports/1,20,42,B/exact&FF=dschool+sports+law+and+legislation+united+states&1,2, 2003-01-15 13:42:14 PT**
10. **User: [Page sent] http://opac.lib.univ.edu/search/ 2003-01-15 13:42:21 PT**
11. **User: [Page sent] http://opac.lib.univ.edu/search/X 2003-01-15 13:42:31 PT**
12. **User: [Page sent] http://opac.lib.univ.edu/search/X 2003-01-15 13:43:06 PT**
13. **User: [Page sent] http://opac.lib.univ.edu/search/Xschool+sports&searchsc[. . .]**

2003-01-15 13:43:19 PT

14. **User: [Page sent] http://opac.lib.univ.edu/search/**
    2003-01-15 13:43:21 PT
15. **User: [Page sent] http://opac.lib.univ.edu/search/X**
    2003-01-15 13:43:39 PT
16. **User: [Page sent] http://opac.lib.univ.edu/search/X**
    2003-01-15 13:43:55 PT
17. **Computer response: [patron - has disconnected]**
    2003-01-15 13:44:28 PT
18. **User: ?**
    2003-01-15 13:44:37 PT
19. **Librarian: Are you still there?**
    2003-01-15 13:44:38 PT
20. Computer response: [patron - has disconnected]
    2003-01-15 13:45:00 PT
21. Librarian: Hello?
    2003-01-15 13:47:08 PT
22. Librarian: note to staff: LOST-Ref
    2003-01-15 13:47:09 PT
23. Computer response: [librarian - user has closed this session]

Interviews

What are the experiences of users interacting in a chat digital reference environment incorporating collaborative tools? This section of the results chapter presents findings from interviews conducted with persons about their digital reference encounters. These were information seekers who had previously contacted and sought information from the chat digital reference service. Information seekers were asked about their experiences to gain a deeper understanding of users' thinking, feelings, and actions concerning their encounter with this service. Interview questions cover five broad categories:

- the chat reference service in general;
- user-librarian interactions;
- user-technology interactions;
- termination of the session; and
- service improvement.

Ryan and Bernard (2000) report that Morse (1994) recommends interviewing at least six persons to learn about experiences. The number of participants reported here is low compared to this number; however, there is value in the data obtained from these interviews; so findings from

interviews are included in the dissertation. Further, the researcher actively sought participants from a variety of sources at the host University from October 2004 to November 2005 to increase the pool of participants.[27] Only the host library and the writing listserv allowed the recruitment announcement to be posted to their users/readers. Although few in number, findings from interviews were insightful, and they support findings from the content analysis. Further, very few studies have provided in-depth reports from the users themselves concerning digital reference services.

One-hour individual interviews were conducted with three students who used the chat digital reference service of a library in the western region of the United States. Students were recruited for the study via an announcement posted on the host library's Web site and on the host University's writing listserv. Students volunteering for the study were asked to complete a pre-screening questionnaire to determine whether they met the following selection criteria:

- Volunteers must have participated in a Web page pushing and co-browsing/escorting activity.
- Volunteers must have had very satisfactory and/or very unsatisfactory collaborative (co-browsing) digital reference encounters.

However, due to the poor response to the recruitment announcement and difficulty in obtaining participants for this study, the second criterion was disregarded. Thus, participants were selected based on their having participated in a chat digital reference session using Web page pushing and co-browsing/escorting. Of the three students selected to participate in this study, two students (one male and one female) were selected from volunteers responding to the recruitment announcement on the host library's Web site. The third student responded to the announcement posted to the writing listserv.[28]

In addition to participants' collaborative tool encounter in digital reference, a variety of other information was gained from the pre-screening questionnaire. For example, all students identified themselves as undergraduates. They reported the following concerning their

[27] Numerous offices and persons at the host university were contacted to recruit participants, for example: the university's general listserv administrator, the Office of Academic Affairs, various other academic departments, individual faculty, Office of Student Affairs, the student center, Student Housing Office, student newspaper.
[28] The content analysis portion of this study showed that a substantial number of students participating in the digital reference service were writing students. When recruitment became difficult, this writing listserv was discovered among the various resources (faculty, academic departments, student organizations, and others) at the host University and was posted to in order to increase the pool of interview participants.

experiences in the chat digital reference environment incorporating collaborative tools: all participated in receiving and viewing Web page(s), clicking on links in Web page(s), and viewing Web page(s) with the librarian; two students participated in receiving URLs; and no student participated in sending URLs. Students reported having two or more years experience using the following technologies: Windows 98, Microsoft Word, the Web, and e-mail, (all three students); Windows 2000 and instant messaging (IM) (two students); Windows XP (one student); Word Perfect (one student); Internet chat (one student); and other technologies, for example spreadsheets (one student). For frequency in use of the chat digital reference service, two students reported as returning users and one reported as a first time user. As regards to whether users disconnected from the service, two students reported disconnecting when their sessions ended, and one reported not disconnecting from the service. As regards to their satisfaction level with the chat digital reference service, one reported as very satisfied, another as satisfied, and the third as neutral. All students reported that they would use the chat digital reference service again.

Although students were listed in transcripts as guest1, guest2, and guest3, this dissertation uses the following pseudonyms: Mary, Joe, and Linda, respectively. These pseudonyms are used to maintain participant anonymity and to maintain the ease of reporting results and discussions. It should be noted that throughout his interview, Joe played around with emoticons and the researcher, figuratively speaking. He often made smug statements; some unrelated to questions asked by the researcher. Joe sometimes contradicted his earlier responses to interview questions and others statements made to pre-screening questions. Often responses made during interviews were followed-up with emoticons, some of which were very trying. The interviews with Joe and the other participants are discussed below in the five sections as previously outlined.

Chat Digital Reference Service in General

1. Can you tell me about your last chat reference experience?

When asked about their last chat experience, Mary and Linda stated that they sought information to help with their writing tasks. Mary specifically indicated looking for information to complete her writing assignment in social ecology:

- *Sure. I had a lengthy paper due for 194W, which is an upper division writing class for Social Ecology. I needed at least two cites that had to do with my research topic*

Conversely, Linda indicated that she used her home computer to seek references from the chat reference service to write a non-assignment related paper. She also commented that the service was helpful and efficiently pointed her to the appropriate information:

- *i was looking for references for a paper i was writing that wasnt related to an assignment and thought it would be helpful to use the online reference as I could get the advice of a librarian while still using my personal computer as home*
- *the chat reference was helpful and directed me to the information i need in an efficient manner-*

Joe indicated that his last visit to the chat digital reference service concerned obtaining a book via ILL. He also indicated that his recollection of the experience was not very good. Following these comments, he began using emoticons and/or gestures, which he did throughout the interview. Whenever Joe used emoticons/gestures, it was displayed in the interview transcript as an "action," followed by the text of the emoticon:[29]

- *The last chat experience was asking about an interlibrary loan item. It was set up that I could electronically order it or have it xeroxed.*
- *I was looking for a book that the teacher had on reserve that I thought i could get from some other library. I wish I'd have reviewed my notes as my memory isn't very strong.*
- {action: } *laughs hysterically.*

Having two participants emphasizing needs pertaining to a writing tasks is probably due to the large number of writing students contacting the digital reference service and due to Linda being recruited directly from the host University's *Writing Listserv*.

2. What positive things happened during this chat reference interaction?

Mary and Linda seemed rather pleased regarding things that happened during their chat digital reference interaction. Their responses to this interview question corresponded to what they previously reported on their pre-screening questionnaires regarding their satisfaction level with the service. During the interview, Mary reported success in fulfilling her need:

- *I was given two sources that hit the spot EXACTLY!!*
- *I couldn't have found anything better if i tried for days.*

[29] A gesture here is a system generated response appearing as text as the result of a participant in the chat environment clicking on an emoticon.

Linda reported in the interview that she benefited from the chat reference experience by learning more simplified and efficient ways of searching, specifically the use of appropriate search terms:

- *the librarian was able to simplify my search by suggesting more efficient ways to locate what i was looking for. For example, certain terms were more applicable for sources from other time periods as opposed to more modern termonology in the area I researched.*

Linda also reported a positive experience, noting that the service's response time was faster than expected.

Joe pointed out a positive aspect of his digital reference encounter in a roundabout fashion. He began by negatively comparing the chat reference encounter to his 60's peer counseling experience. He stated that although the chat digital reference service was not helpful because it provided incomplete and wrong answers, it encouraged students to find their own answers:

- *The chat session, like the one before it, was more like 60's peer counseling - they can't really do anything (and their answers are incomplete and wrong)*
- *but they bolster one's own confidence to find one's own solution. Hmm, do you have a selection bias in your selection of interviewees?*

3. What negative things happened during this chat reference interaction?

Only Mary and Joe reported negative experiences for their chat digital reference interactions. Mary reported that during her interaction, the Web page containing the information she needed failed to display. This resulted in the librarian having to copy/paste the information to her, although she preferred being guided through the information seeking process:

- *It may have been better if I was lead to the cite, just for future reference. I think she tried, however, it was not showing up on my screen. So, she just copy pasted the entire article to me.*
- *If I was guided through the process, maybe I could do it myself in the future. .*

During his interview, Joe reported negative experiences during his chat digital reference encounter: he was multitasking during prime time for the digital reference service and was disconnected from the service; and during another visit to the service, Joe provided staff wrong information for a book via ILL and they sent the wrong book. He ended his response with the emoticon *laughing hysterically*:

- *Actually, the most negative thing was I called during prime time with some sort or other of silly question and I was juggling an Excel worksheet and runon sentences at the same time AND THEY HUNG Up on me (metaphorically speaking.)*
- *The time I was looking for a book, the information was faulty, they did send the book from another library, but, stupid me, it was the wrong book (same author, similar title - I made my usual stupid mistake.)*
- {action: } *laughs hysterically.*

In contrast, Linda did not recall having negative experiences with the chat digital reference service. In fact, her response was favorable about the service. She felt that the librarian's response was faster than expected:

- *I cannot recall a negative aspect to the experience, and the librarian's responses were much quicker than I had anticipated.*

4. How were negative experiences overcome?

Because Mary and Joe reported negative experiences, they were asked how they overcame such experiences. As the researcher was asking this question, Mary was disconnected from the interview session. However, she had provided an answer to this question in response to question three above, stating that when co-browsing/escorting features improperly operated that the librarian copied and pasted the article to her. During Mary's disconnection from the session, the researcher had the opportunity to reread and reflect on the log from Mary's interview. She realized that the topic of Mary's information need was unknown; thus, the researcher asked when she returned to the session, "What was the topic of your question?"

- *I had to find two sources to answer my research question of how Nordstrom employees approacha and assist their customers, customer service.*

Joe indicated that his negative experience was overcome when he realized that the librarian's role was limited, which was to help him focus his information seeking efforts:

- *Yes, of course, I now know they [librarians] have a small use. Mainly to focus my own efforts to finding out whatever I need to find out. I do have a file, I think somewhere of my interactions with them.*

He proceeded in saying:

- *If (the laconic one) I could find them I could write a more detailed SA.*
- {action: } *shakes her head.*

The researcher asked Joe what was "SA," he responded "Essay," followed by the emoticon, "grins evilly." Initially, the researcher thought that Joe's use of feminine pronouns in his emoticons was a mistake, that is, until he continued to do so throughout the interview. This and related responses by Joe caused the researcher to become concerned about him as a participant in the study.[30]

User-Librarian Interactions

This section presents participants' perceptions of librarians with whom they interacted in the chat digital reference environment. That is, how do participants perceive the librarian and/or his or her assistance during the interaction?

5. Can you tell me how the librarian facilitated the search for information during your chat reference encounter?

This served as an opening question as to how librarians facilitated participants' searches during their chat reference encounters. Both Mary and Linda reported being pleased with how the librarian facilitated their information seeking via chat reference. Only Joe reported being dissatisfied with the way librarians facilitated his information seeking via the chat reference service. In fact, all participants' responses here corresponded to the overall satisfaction levels expressed about the service on their pre-screening questionnaires. Mary responded to this opening question by saying that the librarian expeditiously found two citations that perfectly matched her information need:

- *She was able to locate two sources that perfectly matched my paper and what I was looking for. She also did not spend a long time searching. The librarian found the two articles almost immediately*.

Linda stated that she was pleased with the responses, answers, and directions given by the librarian. The positive, rather vague way in which Linda responded to this and other questions made the researcher wonder whether she was a library school major; so the researcher made a note to remember to ask what was her major.

- *I was pleased with the librarian's responses and with the answers and directions given to me.*

[30] When the researcher discussed with her committee chair the feminine pronouns usage in Joe's emoticons, she learned that this was a system-generated response. That is, when anonymous participants in this chat environment clicked on emoticons, the system, not knowing the gender of participants, selected and displayed a gender in the response, not the participant.

Joe, however did not answer the question pertaining to the librarian's facilitation of his search for information within the chat digital reference environment. Instead his answer pertained to the e-mail digital reference librarian's facilitation of the search:

- *As I told you earlier, (I think), the librarian on email found the article and left me with a tutorial site so I could learn how to fetch the article electronically. (I've forgotten or never learned properly how to do that.*

Additionally, Joe commented on areas that the librarian at the physical reference desk was skilled in:

- *The onsite librarian is also good with the usual questions 1)where's the bathroom, 2) where is the Q stacks, 3) did you know you had an interlibrary book waiting for you, here. [Back to next question]*
- {action: } *smirks.*

Linda indicated that the librarian's facilitation of her digital reference interaction was similar to how librarians facilitated interactions in the physical library. They did this by asking questions, focusing her search, and providing personable feedback:

- *The interaction was much like the relation I would have if I was actually in the library. She/he was able to answer my questions much in the same manner as they would in person and was able to ask me questions to ensure they were helping me in my search. The feedback was personable and directed me to sources and ways of looking for more.*

6. What did the librarian not do to facilitate your chat reference experience?

All participants except Linda indicated how the librarian did not facilitate their chat digital reference experience. Mary indicated that the librarian did not lead her through the search process:

- *If I was lead through the process, I would be able to do it myself in the future. However, she just copy-pasted the entire article to me.*

In answering the previous question, Joe referred to his first chat digital reference service encounter, indicating that he was very persistent in seeking the service's help to find information on his Web project, only to learn that they could not help him. Joe indicated that he ultimately had to find his own answers:

- *In my first chat experience, I was to put a web page on the student site. The student site was conspicuously lacking in good information, and the subject hadn'yt and perhaps*

wouldn't be well covered in lecture. I drove the chat librarian crazy, only to find out they did have the answers to the Intro To Computers And Research class for the sociology department. I eventually figured it out mostly on my own.

- {action: } *shakes her head.*

The researcher prompted Joe to continue his response if he had more to say. His continued response was very explicit, in stating that the librarian was unable to facilitate his interaction due to faulty information:

- *Hmm, failure to facilitate. Misinformation, lack of information, wrong information, too busy to facilitate, that about covers it!!!*
- {action: } *laughs hysterically.*

In question seven, below Joe continued to describe how the librarian failed to facilitate his digital reference encounter.

7. What is your perception of the librarian who assisted you during the chat reference session?

Mary and Linda's perceptions of librarians who assisted them were very positive. Their comments corresponded to the satisfaction levels reported for the chat digital reference service on their pre-screening questionnaires. For example, Mary felt that the librarian was "extremely helpful and accurate":

- *Extremely helpful and accurate. She truly did all that she could to assist me. In the beginnings, she asked me to specify more so she could find the exact article that would suit me.*

Similarly, Linda's perception of the librarian was positive. She indicated that librarian who assisted her during the chat digital reference encounter was knowledgeable. In fact, Linda indicated that she was surprised by the librarian's rapid response in focusing her research question:

- *The librarian was knowledgeable about the subject and I was surprised by the rate they were able to direct me to relevant sources and means of directing my research. The librarian was professional and helpful.*

Joe described three librarians assisting him during his digital reference encounters. He perceived these librarians as follows: one was extremely nice but uninformed of his Web page

project; the second was polite but inaccurately assisted with his ILL request; and the third librarian disconnected him:

- *The first person was very, very, nice; just not clued in (webpage). The second one was polite but inaccurate (interlibrary loan). The third one (I think) disconnected me. The last time - they were supposed to be available, but it was finals' week and theyweren't and the email librarian has sent me on a possible, although fruitful, wild goose chase.*
- {action: } *nods solemnly*.

When Joe was asked to further elaborate on his comments pertaining to "not clued in (web page)," inaccurate ILL, and unavailability of the chat librarian, Joe responded that he had to figure out the answer to his own query concerning secure FTP; that the incorrect ILL was not automatically cancelled as he was led to believe; and that the librarian was suppose to be there, presumably during the session when he was disconnected:

- *Oh, I wish I could find my transcripts. I needed help I think with secureFTP or something and figured it out for myself. The interlibrary loan question was I think about having to pay for zeroxing a whole book and cancelling the request - I got the book and the request wasn't automatically canceled as i was led to beleive. The chat librarian was supposed to be .in. (like Lucy's psych booth); I emailed you the page; I decided to email my query. The answer was very thoughtful, but save taking the tutorail which would be good for me, I haven't read the article yet.*
- {action: } *grins evilly.*
- {action: } *winks at everyone.*

User-Interaction with the Digital Reference Technology

The researcher led into this third set of questions by saying "let's talk more about collaborative features used during digital reference (which involves sending URLs and Web pages automatically opening on your desktop when sent or clicked on by the librarian and vice versa)." Only Joe commented following this lead question, though a rather bizarre response.

- *Descriptors of the emoticons is scanty. Forgot the question. Guess so. Not much experience*
- {action: } *goes "ACK.*

8. Can you tell me about when collaborative features were used during your chat reference experience?

Only Linda and Mary reported having participated in chat digital reference sessions employing collaborative tools. Contrary to his pre-screening questionnaire, Joe indicated that he had never participated in chat digital reference sessions employing collaborative tools.

Concerning her chat digital reference encounter employing collaborative tools, Mary referred to a past experience when the features were working properly. Mary stated that she clicked on links and followed the librarian throughout the process:

- *Well, during my last one, it wasn't working. So, I wasn't able to see anything. During my other one (sometime in the past), I was able to just click on the URLs and follow the librarian through the process.*

Mary's response was followed-up with the question: how many times did you use the chat digital reference service? Mary began the response by stating that she used the service between 2 to 4 times and by apologizing for not being able to recall exactly the experience:

- *Definitely at least 2 times. I may have used it 3 or 4 though. Sorry I can't recall exactly.*

In discussing her experience with the chat digital reference service when collaborative tools were employed, Linda was grateful that the librarian sent her links and sources that she could instantly see, review, and ask additional questions about:

- *Once the librarian understood what I was searching for, they sent me links and sources that I could reference. I appreciated the fact that I could almost instantly be directed to these sources. Once I looked at these sources I was able to then ask the librarian for additional assistance or discuss other features that may be relevant to my work.*

Although Joe had previously reported on his pre-screening questionnaire that he had participated in chat digital reference sessions employing collaborative features, he conspicuously began his response with "Uh, Ruth," saying that his sessions did not include any desktop sharing activities:

- *Uh, Ruth, I don't think the MIS people have set it up for someone to take control of my screen (I used to have the program on my Macintosh) Nothing auto-opens.*
- {action: } *nods solemnly.*

Joe's answer, here, definitely threw the researcher for a "loop," because it contradicted his pre-screening response pertaining to collaborative features. The researcher became more suspicious of Joe's interview responses and was rather certain that he was "toying" with her. On his

previous response, he was asked the followed-up question, "What are you referring to?" He then responded:

- *I can't really recall being sent URL's on the online chats*

9. What is your perception about having Web pages sent by the librarian automatically open on your desktop?

When participants were asked about their perceptions of having Web pages open automatically on their desktops, both Mary and Linda liked the idea. Again, Joe indicated that he did not participate in such activities. More specifically, Mary indicated that she loved having Web pages automatically open on her desktop because it made the search process seem more real as though she could do it herself. She presented this viewpoint in both the interview response here and in her response to question ten:

- *I love that idea. It's more tangible and you feel like you can do it on your own in the future.*

Linda thought the automatic opening of Web pages on the computer desktop was helpful. She stated that this allowed her to ask questions and discuss the source with the librarian, who paced the chat digital reference interaction by describing in advance Web sites that were to come:

- *I thought it was helpful as it allowed me to ask questions about the source, if I had any, and the librarian told me what was going to be sent in advance. I thought it was helpful to be able to ask questions and discuss the site.*

Joe was again asked about Web pages opening on his desktop. This time the question pertained to his perception of the activity. His response corresponded below more with what he reported on his pre-screening questionnaire. That is, on the questionnaire Joe reported being a Windows 98 user for two or more years. Joe reported that he did not think that his *Sony Vaio* running Windows XP, an upgrade, was powerful enough to allow Web pages, sent by the librarian, to automatically open on his desktop:

- *I'm running a sony vaio bought at discount about 4 years ago because it was outdated then. I've had to upgrade to Windows XP to run Excel to run the data analysis section for a class. I don't tthink it has the muscle to do that. But I don't think I would mind*
- {action: } *smiles.*

Considering this and previous responses by Joe, the researcher became more concerned and explicitly asked him, "Have you participated in sessions where Web pages opened on your desk top?" Joe replied "no":[31]

- *No. I've done it to others with an apple talk linked set of Macintoshes, tho (not a library chat service...)*
- {action: } *fiddles around.*

The researcher followed-up Joe's response with, "does this complete your answer to the question?" He responded "yes" and again responded using an emoticon.

{action: } *pokes herself in the ribs with a bone-crushing sound.*

- *Yes, what's a bpoke? Oh, now I know*

Based on Joe's previous response about collaborative features, and because of increasing concerns about his seriousness and honesty the researcher decided to cease asking him the remaining questions pertaining to *interaction with the technology* and to work toward ending the interview session with him. Additionally, the decision to stop asking Joe questions pertaining to *user-interaction with the technology* was based on the fact that there were only a few minutes left in the interview session. However, the remaining questions pertaining to *user-interaction with the technology* were asked of Mary and Linda. The interview with Joe resumed with the *termination* set of questions, which are discussed below.

10. How did you feel when the Web page opened on your desktop?

Question 10 is an extension of question 9. The researcher inadvertently submitted question 10 before Mary had completed responding to question 9. Following this mistake, the researcher asked Mary did she have more to say. Mary continued by saying how nice it was seeing the Web page because it made everything seem less abstract and made her feel like she was also facilitating the process:

- *It was nice to actually see the page. It wasn't so abstract anymore and I felt like I was somehow helping further the process.*

Mary's response seemed to be rather illuminating; thus, the researcher asked her to elaborate further. She indicated that the collaborative experience allowed her to remember the process, thus enabling her to become more self-sufficient in the future:

[31] It should also be noted that Joe talks about using a MaIntosh here. The question is: did Joe have two or more years experience using the Mac? If so, why did not Joe check this on his pre-screening questionnaire for two or more years experience using the MacOS?

- *This probably helped me with remembering the process so I wouldn't have to rely on this service (even though I love it!) in the future. If she had just copy-pasted the article to me (like last time), I would probably not remember how to get there or search for something else. But, the other time I used this service, I was given the URLs and the page showed up. This helped me remember how to do this in the future.*

Linda elaborated on the efficiency of having the Web page open up on her desktop. That is, seeing the Web page sent by the librarian allowed her to assess the usefulness of the source and to ask questions concerning the page. Otherwise, if she were just given the URL, she would have had to find the source and return to the chat digital reference service at a later time for answers to questions:

- *It was beneficial and allowed me to quickly determine the usefullness of a source. If I had been given the site to look up on my own at a later time, I would have had to have returned to the librarian with any question. However, this way I was able to see the source and ask questions as our chat was still continueing.*
- *I felt satisfied.*

11. Do you prefer receiving a Web page or an URL during a chat reference session?

As to preference of receiving a Web page or an URL, Mary preferred the Web page and Linda liked both. Mary indicated that she was a visual learner; thus, she preferred receiving the whole Web page:

- *I prefer a web page showing up. It's easier to follow -- visual learner.*

Linda liked receiving both the Web page and the URL. She felt that the URL served as a reference when reviewing the transcript from the digital reference session:

- *I would like both- I think that it would be usefull to list the URL in the chat in addition to the librarian sending the Web page to open. That way, I would be able to reference the URL at a later point by looking at the transcripts if necessary.*

12. How do you feel about viewing the Web pages along with the librarian during the chat reference session?

How do participants feel about viewing Web pages along with the librarian during their digital reference encounter? Mary indicated that viewing the Web page made it easier to follow along with the librarian. This also made her feel less useless in the session because she had contributed to the information seeking process:

- *It was easy to follow. And I didn't feel so useless, felt as though I was assisting along the way.*

Similarly, Linda thought that it was useful to view Web pages along with the librarian, who in turn could point out specific things on the page:

- *It was useful because the librarian was able to mention specific points on the page and I in turn was able to ask questions when necessary.*

13. How do you feel about co-browsing/escorting during the chat reference session?

Mary and Linda felt that co-browsing/escorting was helpful during their chat digital reference sessions. Mary believed these features allowed her to follow the search process both in the current and possibly in future projects:

- *It was helpful to be able to follow the process, not only for future reference but maybe to further the current project.*

Linda also indicated that collaborative tools were helpful to her search:

- *I appreciated it and found it helpful to my search. I didn't require alot of escorting, but appreciated that it was available.*

14. What did you likes about co-browsing/escorting during the chat reference session?

Each participant liked different things about their co-browsing/escorting experience during the digital reference session. Mary considered seeing the Web page enlightening in that it became easier to move forward in her information seeking endeavors:

- *The fact that I wasn't so clueless anymore. The pages showing up made my job easier, and I knew how to move on from there.*

As indicated above in quotes from question 12, Linda liked having the librarian available for assistance during the online information seeking process:

- *The fact that the librarian was available as an active resource in the research.*

15. What did you not likes about co-browsing/escorting during the chat reference session?

Linda indicated below that there was not anything she disliked about co-browsing/escorting during her chat digital reference session:

- *There was not an unpleasant aspect about it in my experience.*

On the other hand, Mary disliked receiving too much instruction on getting to the right Web page, especially when there were numerous pages to navigate through. Mary additionally commented that, although some Web pages were irrelevant to her need, the librarian continued to

send them. The librarian probably sent many of these pages back to back without comments or explanation[32].

- *Sometimes, I felt like she had to instruct me too much on how to get to the right page, especially when there were numerous pages to get to.*
- *The she just went straight to the page, even though this wouldn't help me in future instances.*

16. How do you feel about sending URLs to the librarian during the chat reference session?

Mary and Linda indicated that they did not send URLs to the librarian during the digital reference session:

- *I have never sent a URL to the librarian. I am not sure what I would do it for.*

Linda also indicated that she did not send URLs to the librarian during her digital reference session, but she thought that they were useful in allowing students to discuss specific sources and ask questions:

- *While I did not send URLs to the librarian during my chat session, I think it might be helpful for some students to discuss a certain source or ask a question.*

The researcher asked Linda, "Can you tell me when did you have your encounter with the chat reference service?" She responded:

- *I used the reference during the first week of September, however do not recall the exact date, as I couldn't locate the reference.*

The researcher further asked, "Was it September of this year?" To this Linda responded "yes." The answers provided by both participants concerning their sending URLs to the librarian agreed with the responses made on their pre-screening questionnaires.

17. How do you feel about the librarian sending you URLs during the chat reference session?

Both Mary and Linda expressed the value of receiving URLs during their chat digital reference sessions. Mary especially noted that they were useful to refer back to in the transcript.

- *It is a great idea, especially when we get a transcript emailed to us. This last time, I kept going back to my email and using the informationl.*

[32] This was observed in several transcript sessions during the content analysis of chat digital reference sessions.

Linda was not asked this question because she previously answered it in question 12 above. She too saw value of the URL as a reference source when reviewing the transcript from the session. See her quote above under question 12.

18. What did you not like about the librarian sending you URLs during the chat reference session?

Mary indicated that she disliked receiving a lot of back-to-back URLs because it was confusing. She elaborated below on this constraint:

- *It got kind of cunfusing when the librarian sent me a lot back to back.*

When the researcher asked Mary to further elaborate on this response, she indicated that the librarian went through numerous Web pages to get to the one relevant to her need. Because each Web page also produced numerous URLs, Mary became confused when later reviewing her transcript of the session because it was difficult to determine which one was useful during the digital reference encounter:

- *Well, the librarian would start with the main library page. Then, he/she would guide me through it, sometimes going through 7 pages. And after she sent me the URLs for all these pages, I was confused as to which one I needed. It may have been easier if she started sending me the URLs a little later in the search.*

19. How did these collaborative features impact your chat reference experience?

Both Mary and Linda felt that collaborative features benefited their chat digital reference experience. Mary further elaborated that she was introduced to new features that would possibly enable her to conduct future searches on her own:

- *It enriched the experience because the librarian introduced me to features that I was never even aware of, making future searches on my own possible.*

Linda gave a generic comment to indicate satisfaction with the chat digital reference service. Unlike Mary, she did not give a specific reason:

- *The features were a positive and productive aspect that were beneficial in the resarch.*

Termination

20. Can you tell me how the chat reference session ended?

This question seeks to learn how participants left their chat digital reference sessions. Joe indicated that usually his sessions ran out of time and again commented that a librarian once hung-up on him:

- *Usually I run out of time. Once the librarian hung up on me (figuratively speaking.)*
- *Usually I exhaust their knowledge - did it to you, too, Ruth - and give up. {action: } winks at everyone.*

The ending of Linda's digital reference session was very similar to a traditional reference session. After receiving her answer, the librarian asked Linda if she needed additional assistance. To this, Linda replied, no, and ended the session:

- *Once the librarian had sent me some sources and answered my questions, they asked if there were additional points I needed assistance on. At that point, I was content with the results and closed the session by stating I was not in need of additional help.*

21. How did you leave the chat reference session?

This question is a continuation of question 20. Both Mary and Joe indicated that they thanked the librarian prior to ending their sessions. In question 23, Linda indicated that she thanked the librarian when ending her chat digital reference session. Joe's thanks seemed much like a ritual thank you -- one said merely as a courtesy or said as a routine before leaving somewhere:

- *I usually just back off and agree that we're done and thank them mucho.*
- {action: *} cringes in terror.*

On the other hand, Mary's thanks seemed like one of genuine gratitude. She thanked the librarian for her help and logged out of the session:

- *I thanked her for helping me. And she may have asked me if I needed anymore help. I said no and jus tsigned off."*

In addition to ending the chat digital reference session by thanking the librarian for her help (see question 23), Linda added:

- *After my last comments, I closed the chat window, which ended the session.*

22. Did you leave the chat reference service prior to the librarian entering the session with you?[33]

All participants indicated that they did not leave the chat digital reference service prior to the librarian entering the session. Joe's response to this question seemed somewhat uncertain. He did not think that he logged out of the session prior to the librarian.

[33] During isolation of transcripts, some users in sessions alone disconnected prior to a librarian entering the session with them. The researcher was uncertain whether some of these same users returned to the service and remained online until the librarian entered the session with them.

- *I don't think so, unless I said I had to get to class, thank them and log off...*
- {action: } *cringes in terror.*

Linda explicitly said "no" that she did not leave the chat digital reference session prior to the librarian.

- *No after entering the session, I waited until the librarian responded and that took place with in a matter of minutes.*

Mary just said "no" to question 22 without additional comments, and the researcher did not urge her to comment any further.

23. What did you say prior to leaving the chat reference session?

In question 21 both Mary and Joe indicated that they thanked the librarian prior to leaving their chat digital reference sessions; therefore, they were not asked question 23. Like the other two participants, Linda also indicated that:

- *I thanked the librarian for their help and said that I would not need any more help.*

24. What did you do to end the chat reference session?

According to participants' responses to previous questions concerning termination of the chat digital reference session, they all indicated having ended their sessions by thanking the librarian. In addition, Mary and Linda stated that they signed out of their chat sessions. See above question 21 for quotes from interviews pertaining to their signing out of the chat digital reference session.

25. Where did you go after leaving the chat reference session?

As to what participants did after leaving their chat reference sessions, Linda and Mary stated that they continued working on some aspect of their information seeking goals. When Linda left the chat digital reference, she indicated:

- I continued working on my project at my home.

Mary indicated that she did not go anywhere after her chat digital reference session:

- *I went to the article and read it through. I did not go anywhere on the computer.*
- *the librarian copy-pasted it to me because we were having trouble with the URLs and the website actually showingup*

Joe indicated below that he could not recall exactly what he did when his session ended.

- Can't recall. Back to work. Back to investigating on my own. Off to class...
- {action: } swirls herself around the room, dancing.

Service Improvement

To gain an understanding of students' perceptions about the quality of the chat digital reference service and to gain insights pertaining to service improvement, students were asked a series of questions regarding what they consider to be strengths and weaknesses of the service.

26. Overall, what is your perception of seeking information from a chat reference service employing collaborative features?

Both Mary and Linda thought that there was value in the chat digital reference service. For example, Mary indicated that the service was a great creation and that it was practical and efficient:

- *I think it is the greatest creation. Not only is it practical to chat with a librarian, but it saves time and quickly finds what you need.*

Linda also suggested that there was value in the digital reference service:

- *I would recommend it to other students and think it is a beneficial source to supplement independent research.*

Initially, Joe expressed optimism concerning the value of the chat digital reference service, noting that he liked the idea in principle:

- *Sounds like a budding field. Can I work there, too?*
- {action: } *chortles demonically.*

When asked to elaborate further on the above point, however, Joe expressed pessimism concerning the value of the chat digital reference service. He stated that in practice the Web encyclopedia *Wikipedia* was more useful, and he questioned the value of the University reference service online:

- *How are you coding this?! I like the idea, inprinciple. In practice, Wikipedia is more useful. How can [Univ] staff on online reference service worth its salt?*
- {action: } *shakes her head.*

27. What do you perceive as strengths of such a chat reference service?

Although Linda and Mary previously commented on what might be considered as strengths of the chat digital reference service, only Linda was explicitly asked this question. She described strengths of the chat reference service as providing: 1) access to the librarian's knowledge during the session; 2) access to the transcript from the session for future reference; 3) and a fast response time when directing students to resources:

- *It allows students the benefit of a librarian's knowledge while they are unable to be at the library, or at home. The service allows you to interact with a librarian and keep a record of their assistance for future use. It directs students to sources quickly and in a timely manner.*

28. What do you perceive as weaknesses of such a chat reference service?

Participants varied in what they considered as weaknesses of the chat reference service. According to Mary**,** the weakness of the chat reference was her own discomfort level when asking many questions:

- *Sometimes I felt uncomfortable asking so many questions because I felt I was a burden and too needy.*

According to Linda, the weakness of the chat digital reference service was that it was not widely promoted at the university:

- *At my university at least, I think it should be more widely advertized. It was helpful, yet I don't think many students take advantage of it .*

29. What would you like to see changed about chat reference services employing collaborative features?

Participants varied in their responses as far as what they would like to see changed about the chat digital reference service. For instance, Mary commented:

- *Maybe to make sure that the pages show up on the screen.*

Linda recommended changing the hours of operation for the chat digital reference service:

- *I cannot think of an element I would change. There are only certain hours for the service and perhaps expanding those would make it more available to additional students.*

30. How do you think the chat reference service can be improved?

In terms of improvements to the chat digital reference service, both Mary and Linda made suggestions in their answers to question 29. Mary suggested ensuring that Web pages display properly and Linda suggested longer operating hours for the service. Joe was still troubled by not receiving the help needed from the service to complete his Web project. Hence, this experience probably impacted his response pertaining to service improvement. All of the areas for which he recommended improvements centered on the digital reference staff:

- *Experience and motivation of the staffers. Even a who's who to which identity one is conversing with. I need good answers, fast. Like, e.g. where's the bathroom. There's no reason why the online librarian staff couldn't have helped me with the webproject - its been a staple of the class for a number of years.*
- {action: } *grins evilly*.

31. Did you obtain the information you needed prior to leaving the chat reference service?

As they had answered in previous responses, both Mary and Linda indicated that they received the answers to their information needs prior to leaving the service. Mary indicated:

- *Yes i did and was very satisfied with it.*

Linda indicated:

- *Yes, I was given information that met the needs of my research and would help me in later research.*

Obviously, based on his prior responses, Joe did not feel that his need was met by the chat digital reference service, especially with his Web project. So he was not asked this or the following question.

32. Did you like the way the information was delivered?

Linda and Mary both focused on the clarity with which their answers were delivered. In addition, Mary indicated that the answer was concise. She was not asked to further elaborate on this question due to her response in question 2: "*I was given two sources that hit the spot EXACTLY!! I couldn't have found anything better if i tried for days."* However, in terms of delivery of the answer, Linda indicated below in her response that the answer was clear and the librarian guided her through the search process:

- *Yes it was clear and the librarian directed me through it.*

Elaborating further on her previous response, Linda stated that it was helpful seeing the content of the Web page sent by the librarian and having the librarian's presence online to answer additional questions pertaining to the page and/or its content:

- *I liked the fact that the web pages were sent to me and that I was able to actually see what the librarian was mentioning as a helpful resource. This was in ways more helpful than a librarian writing down a link and then having me look it up independently and searching for specific points without their feedback. Also I was*

shown results from within our univsersities library and able to look through the sources with the input of the librarian when necessary.

33. Would you use this chat reference service again?

All interviewees said that they would use the chat digital reference service again and their answers corresponded to their responses on the pre-screening questionnaire. For example, Mary indicated:

- *Every time!*

Contrary to the dissatisfaction expressed with the digital reference service during his interview, Joe stated that he would use the service again:

- *Of course I would. When one has writer's block, what better source to turn to. There like suicide prevention of the internet - suicide prevention can't really stop desparate suicides (they in fact don't even know about them.) But they can offer solace and a glimmer of hope that the answer is out there somewhere and even a blind lead helps the process continue to finding THE ANSWER.*
- {action: } *falls over, dead.*

In addition to stating that she would use the service again, Linda stated:

- *Yes and I would recommend it to other students.*

The researcher finally asked Linda what was her major/discipline area, to which she responded:

- *English*

Although the researcher did not ask additional questions of any interviewee following this last question, Joe was puzzled that the researcher had not responded to any of his emoticons.

- *Didn't even see my beautifully constricted emoticons??*

Of course, the researcher had seen these emoticons but chose to disregard and not comment on them during the interview. The researcher thanked and said goodbye to Joe. He commented that he was going to tend to his wife as seen below in the quote from his interview:

- *I'll go tend to my wife, now. See you in the funnies*

Joe's last comment further assured the researcher that indeed he was a male communicating with the researcher and that he was amusing himself by making sometimes vexing responses and by trying to get the researcher to respond to his comments and emoticons. As previously stated, several of Joe's interview responses were questionable, including his pre-screening questionnaire. Nevertheless, there were enough patterns found in his interview

responses to cautiously obtain reliable data. For example, numerous times during the interview, Joe expressed dissatisfaction with digital reference librarians. These responses somewhat corresponded with his neutral response on the pre-screening questionnaire pertaining to service satisfaction level. He indicated on both the pre-screening questionnaire and during the interview that he would use the service again. One of his comments concerning service improvement seemed insightful, particularly with regards to knowing the identity of digital reference librarians.

Limitations

One limitation of this research was that observations were textual (chat transcripts) causing the researcher to be confined to analyzing thoughts, feeling, and behaviors of participants as expressed in text. Because of textual observations, the researcher was unable to observe human non-verbal cues or body language. The lack of visual cues caused speakers in transcripts to communicate in short disconnected or fragmented dialogue, in which their messages often overlapped each other, thus, augmenting the difficulties of coding and content analysis. This restriction limited the researcher to select participants for interviewing from among volunteers recruited via the host library's Web site, the host university, and its listservs. In addition to the lack of visual and audio cues, some users had multiple e-mail addresses when contacting digital reference services, therefore making it difficult to identify them as repeat users.

The lack of physical observations of librarians and their computer consoles during chat digital reference interactions was another limitation. Such observations might have informed the researcher of other means of identifying co-browsing/escorting within transcripts other than from the dialogue of speakers.

The library in this study was unique in that it had its own set of policies, staff technological skills levels, service digital reference delivery technology, and related factors. Because of the particularity, the study was limited to the chat digital reference service of this specific library. As a result, the study is not generalizable but only transferable to other digital reference services of similar type.

The researcher was unable to interview participants immediately following their chat digital reference encounters; this extended lapse in time limited the ability of participants to accurately recall or interpret their digital reference experiences. Additionally, privacy issues restricted the researcher's ability to identity and select participants from the transcripts themselves for interviews. These privacy issues, also constraints, limited the differentiation between repeat users and first-time users of the digital reference service.

CHAPTER 6

DISCUSSION AND CONCLUSION

This was an exploratory study concerning the impact of collaborative tools on digital reference users. More specifically, the study addressed user needs, benefits, and barriers pertaining to seeking information in the chat digital environment. The following research sub-questions were asked:

- What are the benefits of collaborative activities on digital reference users?
- What difficulties do users encounter during collaborative digital reference encounters?

It is hoped that answers to these questions will help in the development of higher quality user-oriented digital reference services.

Discussion

Three hundred forty-two transcript sessions were analyzed from a chat digital reference service affiliated with an academic library serving over 20,000 users. These sessions covered the period from September 2002 to May 2004. Eighty-six percent of these sessions were comprised of undergraduate students and 14% were comprised of graduate students, each of whom engaged in interactions to resolve their information needs. However, prior to discussing these interactions themselves, it is good to discuss the opening and closing of digital reference sessions.

A digital reference session generally began when users submitted their initial information need. Although these need statements (typically appearing at the beginning of chat sessions) generally triggered information seeking, the initial human interaction generally did not begin until the librarian entered the session and began to personally dialogue with the user. Prior to this personal dialogue, computer scripts were sent alerting the user that a librarian would be with him or her shortly. In addition to computer scripts, the librarian sent welcoming scripts prior to beginning to personally dialogue with the user. These welcoming scripts generally represented the first step in establishing rapport with the user until the librarian entered the session. These personal greetings injected warmth and friendliness into the digital reference process. These

pleasantries were typical norms in a digital reference interaction. Moreover, librarians displaying such approachable behaviors helped to establish an inviting work environment for the initial contact users had with the digital reference service (Ronan 2003b; RUSA 1996). Interestingly, such librarian behavior sets the tone for interaction readiness, by signaling to users that it was all right to begin reciprocating with like greetings, or that it was all right to begin answering/asking questions, or related utterances. Conversely, in face-to-face reference services, the mere presence of the user at the reference desk or the mere utterance of the query by the user to the librarian at the desk typically would elicit an interaction between the two; thus, in comparison, the initial chat digital reference interaction was librarian-driven.

Just as librarians' personal greeting statement signaled the opening of the interaction, user *goodbye* statements sometimes signaled closing of the interaction. Unlike the initiation of user-librarian interactions, the closing of the interaction was user-driven. For example, users generally indicated that they were leaving or about to leave the chat digital reference interaction by saying *bye* and *goodbye*. Sometimes expressions of gratitude such as *thanks* and *thank you* indicated that users were ending or about to end the interactions. However, it was often difficult to determine whether such expressions of gratitude represented actual gratitude or were simply some ritualistic indicator of closings.

Moreover, a few sessions ended without the librarian's awareness that the user had left the session. In these few sessions, users just evaporated, leaving without giving any sort of closing prompt or notice that they were leaving the sessions. This caused uncertainty for librarians about the status of the interaction. A few other sessions also ended abruptly without users giving prior notice to librarians. As the chat transcript sessions indicate, librarians immediately noticed such user departures from sessions, because they generally were related to technological difficulties.

Session Length

While online reference sessions varied in length, on average they lasted approximately 15 minutes, a median value, with the majority of these sessions clustering at the low end at 10 minutes or less. This value is consistent with values reported for average session length by other authors (for example, IFLA 2005; Coffman and Arret 2004; Ward 2004). Yet, this comparison should be considered with caution for these authors do not say whether their averages are mean, median, or some other average. Thus, it is difficult for this researcher to accurately compare the

average session length of this study with those of other chat digital reference services or other reference services such as phone, traditional reference, email, and the like. Although data are lacking regarding average session length, Coffman and Arnett have reported that data from call centers indicate that it takes about twice as long to answer a question via a chat session than it does via a phone session.

Strategies Facilitating Interactions

Information seekers in the digital environment incorporating collaborative tools used a variety of strategies to facilitate their search for information. One, participants physically interacted with content and objects by browsing, co-browsing, sending URLs, and the like; two, participants communicated using strategies such as asking questions, confirming/acknowledging, and using abbreviations/emoticons; and three participants engaged in educationally related activities. Using these strategies, information seekers were able to work cooperatively with librarians in the digital environment to resolve their information need.

Users communicated with librarians and interacted with technology and content in the digital environment. Therefore, users were active participants in browsing and co-browsing objects and content. Browsing involved users viewing content and/or objects on the library's Web page/site haphazardly or without the implementation of co-browsing/escorting tools. Co-browsing involved simultaneous browsing between both user and librarian. Co-browsing/escorting tools permitted co-browsing by allowing librarians to share their desktops with users, thus allowing users to see and follow along as the librarian navigated through the Web site clicking on hyperlinks and vice versa. Prior to sending Web pages, a typical pattern of librarians was to confirm/acknowledge that users could see pages sent via co-browsing/escorting features. During this activity, librarians seemed to always begin from the library's home page.

To confirm/acknowledge whether users had received URLs and Web pages, librarians generally asked users closed-ended questions such as *do you see* or *did you receive the library's home page*? *Do you see the link*? Users typically responded to such questions by confirming/acknowledging *yes, no*, or the like. This communication pattern of asking questions and confirming/acknowledging generally was seen throughout the digital reference process. Both users and librarians sometimes communicated by asking more open-ended questions. These questions allowed users and librarians to gain a focus concerning what Dervin (1986) has referred to in traditional reference services as a cognitive gap. In digital reference, like traditional

reference services, the user with an information need presents his or her question to the service where s/he typically engages in social interactions with the librarian in order to resolve the information need (Katz 2002; Bopp and Smith 2001; Taylor 1968).

Thus, asking questions was a powerful strategy employed by users and librarians in chat digital reference sessions, for the feedback received helped to focus or clarify the information need. For the librarian, questions asked of the user generally followed patterns of the reference interview in face-to-face reference services (Taylor 1968). For the user questions asked of the librarian, especially following the initial need statement, generally represented a shift in the information need, as noted by Lynch (1977) in her dissertation research of a traditional reference service. A number of researchers concerning the information retrieval in traditional reference services have speculated about the specificity of the information need lying somewhere on a continuum between unfocused needs and focused needs (Ingwersen 1992; 1998; Kuhlthau 1991; Belkin, Oddy, and Brooks 1982; Taylor 1968). Thus, when the digital reference user is able to better specify his or her information need, the initial need statement is restated as a more focused statement of need.

Sending abbreviations/emoticons was another communication strategy information seekers used to actively participate in the digital information seeking environment. Since information seeking using a synchronous communication medium such as chat tends to be rather fast-paced and since typing full words can be slow, some information seekers opted to use shorthand forms of words such as *thanks* (thx), *I see* (ic), and *ok* (k); or they opted to use expressions such as *smiling faces* (-:)), *sad faces* ( )-:), and the like. According to Herring (1999, 1996) and Werry (1996) these short hand strategies are used to compensate for the lack of visual and audio cues in the digital environment.

Information Literacy in the Digital Environment

Information literacy opportunities sometimes arose during the digital reference process. These were opportunities for librarians to teach and for users to actively engage in learning about library services, its resources, and the like. Information literacy opportunities generally came about when users asked open-ended questions such as: *how to search the OPAC*? *How to search a specific* database? *How to get to a particular resource or services online or offline*? To answer such questions, librarians would often conduct demonstrations, instruction, and guidance.

Demonstrations involved educational related activities in which the librarian outlined a series of steps or procedures on how to perform a search of the OPAC or database. Two patterns of demonstrations were seen in these chat digital reference sessions. These were demonstrations without co-browsing/escorting and demonstrations with co-browsing escorting.

Demonstration without co-browsing/escorting involved the librarian showing the user objects on the Web page but without the implementation of the co-browsing/escorting tools. Here, users and librarians engaged in collaborative viewing, searching, and the like of particular resources on the Web page, typically by pasting-in and sending URLs via the chat text box. This type of demonstration typically resulted when users were unable to open or see whole Web pages that were previously pushed to them. Sending pasted-in URLs generally resolved this constraint by allowing users to receive the URL, click on the URL sent or paste the URL into his or her browser to open and see the Web page. When they sent URLs to users, librarians also gave them directives, for example, on performing searches based on what was seen on the Web page. When co-browsing without the implementation of co-browsing/escorting tools, users were unable to see and follow along as the librarian clicked on hyperlinks in the Web page and navigated through the Web site or database. However, users were sent URLs and given a series of directives pertaining to the same Web page that the librarian was viewing. For example, librarians directed users to: *select Articles Databases, scroll to Expanded Academic, select the University, use advanced search*, and so forth.

Demonstration with co-browsing/escorting involved instances when the librarian sent whole Web pages using co-browsing/escorting tools. Prior to or immediately following the pushing of pages, librarians typically told users what to expect or what they were doing. For example, before pushing a page, the librarian would tell the user that s/he would be clicking on objects such as the *Article Databases, the letter E under By Title, Expanded Academic ASAP, and the link to the University*. Users typically participated in these activities by following the librarians' directives concerning what to click. For example, to search for a specific journal title, the librarian pushed the user the whole Web page for a specific database, then with a series of directives told the user to: *type in the name of the journal; look at the first box; look at the third box; click on submit*, and so forth. During demonstrations, librarians often explained what they were doing and why.

As previously stated, during demonstrations, users also were given instructions, explaining the *why* when trying to search or navigate through the OPAC, databases, or the system as a whole. For example, prior to demonstrating searches of databases or the OPAC, librarians sometimes explained:

- the difference between the OPAC and bibliographic databases;
- the difference between a title search and an author search;
- why one database was used as opposed to another;
- by defining search or system concepts; or
- search logic (for example Boolean operators).

During instruction, it was sometimes necessary to point users to specific objects or content on the Web page/site.

Guidance involved the librarian navigating or directing the user through the online reference service and occasionally the face-to-face reference service. During such navigations, librarians pointed users to various Web-based resources and services by pushing pages and/or pasting-in URLs, thus educating users to the *where* and *what* about the system, its resources, and services. Other directives by librarians to users were in response to users asking how to obtain copies of book titles in the OPAC or journal articles in specific databases. Librarians pointed users to floors in the library containing specific call numbers. Librarians pointed users to resources and services by saying, for example: *see the red button at the bottom of the page; look at Lexis Nexis; try newspapers* [in a list], and so forth. Users were even pointed to resources outside of the digital environment, if necessary. In such instances, users were told to seek experts at other locations. For example, users were directed to *go to the Science Library* to obtain certain science books. In other instances, users were directed to *see the science librarian* to obtain better assistance with their topic. Guidance typically did not involve sequential step-by-step directives. Given these pointers and directives, users were able to navigate through both the digital and physical environment to seek information relevant to their needs.

Benefits

Although previous discussions indicated some benefits of collaborative tools for users, these findings were primarily from chat digital reference transcript sessions collected by the researcher. However, this section on benefits and the one below on barriers include quotes from users whom the researcher actually interviewed. The responses from interviewees generally

supported findings from the analysis of chat digital reference transcript sessions. Of the three persons interviewed, two generally indicated that they benefited from and were empowered by collaborative tools when seeking information in the digital environment. For example, the interviewee Mary elaborated, "It was nice to actually see the page [received via co-browsing/escorting]. It wasn't so abstract anymore and I felt like I was somehow helping further the process." She further said, "This probably helped me with remembering the process so I wouldn't have to rely on this service (even though I love it!) in the future." Linda also elaborated on the usefulness of having the Web page open on her desktop. She liked being able to immediately see and assess the usefulness of the resource in question and liked that it saved time by not having to leave the session, review the source, have a question, and then have to return to the chat digital reference service to ask the question of the librarian. Thus, both Mary and Linda believed that receiving whole Web pages was useful because the pages enabled them to click on URLs and follow the librarian throughout the information seeking process. Copies of chat transcripts served as a reference source to use to consult again in the future. Two of the interviewees believed that being able to view Web pages along with the librarian added value to their chat digital reference experiences. For example, Mary said, "It was easy to follow. And I didn't feel so useless, felt as though I was assisting along the way." Linda said, "It was useful because the librarian was able to mention specific points on the page and I in turn was able to ask questions when necessary. " Mary commented about having the URL of the online reference process mailed to her at the end of the session: "It is a great idea, especially when we get a transcript emailed to us. This last time, I kept going back to my email and using the information."

Barriers

As previously stated, although findings generally indicate that users benefited from the chat digital reference service incorporating collaborative tools, there were some barriers to the process. Wilson (1981) noted in his information behavior model that many factors positively affecting interactions constrain the very interactions that they benefit. Such a paradox existed in chat digital reference services implementing co-browsing/escorting and URL pushing features. Chat digital reference interactions are constrained by messages overlapping one another, thus causing important points to become lost. These barriers were typically pointed out to the researcher by interviewees. For example, in some transcript sessions, receiving numerous URLs

back to back without explanation or descriptions confused some users. Mary elaborated on this constraint: "*And after she* [the librarian] *sent me the URLs for all these pages, I was confused as to which one I needed. It may have been easier if she started sending me the URLs a little later in the search.*" Some barriers to the digital reference process were technologically related, involving user disconnections, or involving Web pages or links not opening. Although one user felt less empowered, librarians occasionally found ways to compensate for such constraints as indicated by Mary: "*It may have been better if I was lead to the cite, just for future reference. however, it was not showing up on my screen* [Web page displaying article]*. So, she* [librarian] *just copy pasted the entire article to me.*" Other constraints to the digital reference process concerned long delays without receiving responses from users. Finally, the inability of participants to read each other's body language because of the lack of visual and audio cues was another barrier.

As previously discussed, missing cues impeded the digital reference process. Not being able to see and hear one another caused some cognitive dissonance, especially when users and/or librarians engaged in activities that took a long time or activities where users' expectations were not previously set. In the example in the previous paragraph, the interviewee became confused when the librarian sent many URLs back-to-back without notice of what was to come or without explanations after URLs arrived. In addition uncertainty arises when users are multitasking and the librarian does not know. Such an incident happened with Joe, an interviewee, who believed that the librarian disconnected him because he was multitasking and not paying attention, and because he had contacted the service at a busy time. Although Joe was still online and not paying attention to the interaction, it is possible that the librarian was uncertain of his online status. A number of authors have reported on the phenomenon of the evaporating user (Janes 2003; Kresh 2002/2003), where it is believed that some users become impatient and disconnect from the service (McGraw, Heiland, Harris 2003; Foley 2002; Gross et al. 2001).

The previous discussion has outlined several constraints to the online chat interaction as the result of missing cues. A number of authors have reported on missing cues in other digital reference services (Francoeur 2001; Straw 2000; Fishman 1998; Abels and Liebscher 1994; Roysdon, Elliott, and Elliott 1988). As previously discussed, users participating in chat digital reference services have devised a shorthand strategy of communication using abbreviations/emoticons. Werry (1996) noted that online users have evolved and adopted such

linguistic strategies to adapt to the constraints of media such as chat, whose participants are unable to see and hear one another. Werry further asserted that such linguistic strategies are attempts to avoid ambiguities, which are typically negotiated in face-to-face communication by paralinguistic cues such as intonations, pauses, gestures and gazes (p. 52).

However, some persons oppose having librarians use abbreviations/emoticon expressions in digital reference services considering such expressions to be crude, unprofessional (Janes 2004) and a degradation of the English language (Rovner 2005; Rawson and Gillespie 2005). Proponents for librarians using abbreviations/emoticons in digital reference say this is the way users communicate in chat digital reference, and librarians should try to understand and mirror such strategies to help alleviate ambiguities (Janes 2004; Ronan 2003b). Regardless of how librarians feel about using abbreviations/emoticons, echoing Janes and Ronan, these online expressions represent the strategies employed by people being served in the digital environment. Therefore, librarians should try to understand and lessen ambiguity during information seeking. If it enhances the digital interactions by mirroring paralinguistic cues of digital users, then librarians should follow suit.

Analogies Between Digital and Traditional Reference

From observations in this study pertaining to URL pushing and co-browsing/escorting in chat digital reference services, a number of analogies can be made between user-librarian activity in chat digital reference services and user-librarian activity in traditional reference services:

- Users sending URLs for a journal link containing bibliographic information might be analogous to users giving bibliographic information on a sheet of paper to librarians in the physical library.
- Librarians sending users URLs for PDF journal articles might be analogous to librarians in the physical library giving users the actual journal article.
- Librarians sending users URLs to the online ILL form might be analogous to librarians in the physical library giving users a copy of the ILL forms.
- Users asking questions of librarians in digital environments might be analogous to users asking questions of the librarian in the physical library.
- Users co-browsing Web page with librarians might be analogous to users co-browsing Web pages with the librarian on her computer screen in the physical library.

- Users participating in visual demonstrations via co-browsing/escorting of the OPAC or database might be analogous to users participating in hands-on demonstrations of the OPAC or database in the physical library.
- Users sending emoticons of smiley faces to librarians in digital reference might be analogous to users smiling at the librarian in the physical library.
- Users sending *thx* to librarians in digital reference might be analogous to users thanking the librarian in the physical library.
- Many more analogies might be made regarding the use of abbreviations/emoticons in the digital environment and their representation of the physical environment.

In addition to analogies made between processes conducted in digital reference and those in traditional reference, some analogies can be made for possible statistics and measures collected in digital reference and those collected in the physical library. The digital reference service might collect statistics and measures data pertaining to ILL, PDF documents, bibliographic citations, and bibliographic instructions. For example, such statistics and measures might be stated as:

- the number of PDF documents sent to users during digital reference sessions;
- the number of ILL forms sent to or completed by users during digital reference sessions;
- the number of bibliographic citations filled for users during digital reference sessions; and
- the number of information literacy opportunities provided users during digital reference sessions.

Cooperative Work

In the chat digital reference environment incorporating collaborative tools, users and librarians embarked on a joint working relationship to resolve the information need. Collaboration between the two consisted of utilizing various communication strategies such as asking questions, using abbreviations/emoticons and confirming/acknowledging to facilitate their interaction. Users' work with librarians was further enhanced by their interacting with technologies such as URLs, Web pages, and the like to allow them to interact with content by co-browsing and browsing to view information in the information seeking environment. The implementation of collaborative tools by librarians allowed users to see and follow their

movement through the Web page/site and vice versa during the search for information from databases and the OPAC. Conversely, when users and/or librarians sent pasted-in URLs, they were each able to see what the other was viewing or browsing although they were unable to follow librarians throughout the Web page/site when clicking on hyperlinks.

Twidale, Nichols, and Paice (1997) refer to such a working relationship between people as cooperative work. Being able to interact with librarians, technology, and content empowered users, by allowing them to become active participants in the digital information seeking process rather than being passive participants in the process. Moreover, collaborative tools allowed work between users and librarians to extend beyond the reference interview to educational activities, which have implications for information literacy in the digital environment. Among these implications are the following:

- The needs of users who are visual learners can be addressed in the digital environment.
- Distance education students can not only see what librarians are doing but they can interact with the technology and content of the digital environment.
- Users in the digital environment can immediately see, assess, make relevance judgments about search results from the OPAC and databases, and ask the librarian questions.

Research Questions

What are the benefits of collaborative activities on digital reference users?

Collaborative tools empower users by allowing them to become more knowledgeable and self-sufficient, and by allowing them to keep a record of their digital reference interactions for future references. Being able to see what librarians are doing makes what they say and do seem less abstract for users, thus allowing them to remember the process. This allows users to ask questions immediately, when necessary, and allows them to understand how they contribute to the information seeking process. Also having a live librarian in the online information seeking environment allows users to have immediate access to his or her expertise to help facilitate the information seeking process. In addition, users are able to immediately see search results and assess their value without having to leave the session and return to ask a question. Collaborative tools allow users to engage in visual learning activities where they can see and follow the librarian as s/he navigates through the Web page/site.

What difficulties do users encounter during collaborative digital reference encounters?

A number of barriers occurred in the digital environment incorporating collaborative tools. Such barriers include navigating and viewing, which comprised the largest category of technological barriers. These typically included problems receiving Web pages, opening hyperlinks, and viewing Web pages. Thus, these made it difficult for users to see content and objects on Web pages and made it difficult for them to move about within the Web page/site. Further, system delays and disconnections made it difficult or impossible for users and librarians to work in the digital environment to resolve the information need. When librarians tried to compensate for pages not opening, they pasted-in and sent URLs from their chat text box to users. Although pasted-in URLs allowed users to see the Web page, they did not allow users to see and follow what librarians did as they navigated through the Web page/site. Some librarians sent users numerous, back to back URLs and Web pages without prior notice of what to expect or without even explaining or describing what the URL or page was or contained. Because user expectations were not previously set, receiving many back-to-back URLs and Web pages confused users. Finally, by not having human visual and audio cues, sometimes users and librarians became uncertain of the other's online status.

Lessons Learned

To date, QuestionPoint appears to be the only digital reference software which labels collaborative tool activity in transcripts when it occurs during chat digital reference sessions. When conducting research of digital reference services whose technology does not permit automatic labeling of co-browsing/escorting activities in transcripts, the following indicators might be useful in identifying the occurrences of these activities within digital reference transcripts:

- Librarians sending a scripted message prior to implementing the co-browse/escort features describing as they navigate through Web pages that users screens would change automatically allowing them to see pages in the left-side screen and allowing them to see an item sent message in the chat box.
- Librarian asking users if their screen had changed;
- Librarians explicitly telling users that they are going to use co/browsing/escorting features;
- Librarians telling users that they are going to take over their browsers;

- Librarians telling users to watch what they do or to watch their arrows;
- Librarians telling users that they could see their screens;
- Librarians telling users, "lets search together;" and
- Librarians telling users, "I will show. . ."

Conclusion

Users of chat digital reference environment incorporating collaborative tools seem to be active, non-passive users working cooperatively with librarians and engaging with technology and content to meet their information needs. Considering this cooperative working relationship between users and librarians, at least four outcomes from the study have been identified that empower users in the digital environment. First, users can immediately see what librarians are doing and saying, thus making the digital process less abstract and more easily followed. Second, users can browse content and objects on Web pages and can immediately interact with it by clicking on links, asking questions of the librarian, and by making relevance judgments. Third, users can send URLs for full citations to librarians to help clarify the information need. Fourth, users can memorize more easily the digital reference process and can be more confident about performing tasks such as selecting databases; using appropriate search strategies; and conducting actual searches in databases and/or the OPAC.

Future Research

To become a valued service for information seeking in the digital environment, the library needs to ensure that its digital reference services not only provide quality information but also provide quality, dependable technology for users accessing the service. More research needs to be conducted in the area of minimizing technological delays and disruptions in chat digital reference services in order to better implement co-browsing/escorting tools. These tools aid the librarian in facilitating information literacy in chat digital reference services, thus they help to empower the digital user. Additionally, when using collaborative tools, some confusion for users might be alleviated if librarians were to make a general practice of telling users what to expect prior to sending or navigating through a series of Web pages. Moreover, this makes the transcript sent to users following their digital interaction a more useful resource for future reference. Until video and VoIP become standard digital reference tools, perhaps librarians need to educate users

who are multitasking to keep them informed of their online status. Considering these problems and others identified during the study, future research questions are as follows:

- Are there instances when just pushing a Web page to users without a reference interview sufficient?
- From the user's perspective, how effective is instruction in digital reference?
- To what extent do librarians set users' expectations prior to sending multiple URLs and Web pages?
- To what extent do librarians lacking RUSA behaviors contribute to user disappearances during the digital reference process?
- To what extent are abbreviations/emoticons inappropriate for the digital reference process?
- What are user beliefs concerning librarians leaving the digital reference sessions while they (users) are still online?
- To what extent do users accessing digital reference services from within libraries failing to logoff when their sessions end because they leave to go retrieve documents recommended during their sessions?
- Do users say *thanks* or *thank you* to indicate satisfaction with the service or to give notice that they are leaving the interaction?
- What is the relationship between interactions dominated by the user in the early phase of the interaction and the extent to which the information need is focused?

APPENDIX A: DISCARDED TRANSCRIPTS

DISCARDED TRANSCRIPTS

Several transcripts were eliminated in deriving the sample because they identify information seekers other than students in the status line of the transcript. For example, D-transcript #209061 (line 1) below indicates that the information seeker is *not affiliated* with the university of the host library:

D-Transcript #209061

1. STATUS: Not Affiliated
2. User: I am wondering about the difference between a Sunni and Shia Muslim. Any sources you can point me to would be great.
3. Computer response: A librarian will be with you in about a minute.
4. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
5. Librarian: I am sorry, but the Univ Libraries "Ask a Librarian" service is not able to provide in-depth research assistance to individuals who are not Univ students, faculty, or staff. I suggest that you check your local public liubrary or see this site -- the Internet Public Library at http://www.ipl.org/

Similarly, D-transcripts #35397 (line 1) and #406966 (line 1) were removed because the information seekers are not students but are faculty and university staff, respectively:

D-Transcript #35397

1. Status: faculty
2. User: I was looking for an article in World Psychiatry by SV Faraone, but can't find the journal, does any UNIV have it? Thanks.
3. Computer response: A librarian will be with you in about a minute.
4. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
5. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
6. Librarian: I will check in [System Name] to see which UNIV library has World Psychiatry. Is that the full name of the journal?
7. Librarian: Did you find the article in PsycINFO? I could double-check there.
8. User: I did not see it there.
9. User: I tried pubmed and they did not have it.
10. [. . .] [34]

D-Transcript #406966

1. STATUS: Univ Staff
2. User: when was univ founded?

[34] Ellipses [. . .] in brackets within or at the end of transcript excerpts indicate the following text has been deleted and that the deleted text does not, I believe, detract from the meaning being conveyed in the discussions.

3. A librarian will be with you in about a minute.
4. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
5. Librarian: HI! There's some information on the web about this, let me show you....
6. User: ok.
7. Librarian: ok, i'm going to send a website to you...
8. Lbrarian: [Page sent] http://sunsite.berkeley.edu/uchistory/index.html
9. User: wow, cool. thanks.
10. Librarian: if you click on the ten campuses link, you'll see a list of all the univ campuses
11. Librarian: just click on [univ name] to get the info you need.
12. Computer response: [user - has disconnected]
13. Computer response: [user has closed this session]

In addition, transcripts containing speaker names, missing speakers, and no status were removed. As seen below in D-transcript #23316 (lines 5, 8-10), the speaker whose name is listed appears to be the user. This person's name was replaced by *Person Name* to protect the speaker's identity:

D-Transcript #23316
STATUS: UNIV Graduate

1. User: Do we no longer have a subscript ion to the World News Connection? The professor I am working with specifically requested that I access that international newspaper service.
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
5. **Person Name: I have tried several on-campus computers and cannot access the site.**
6. [. . .]
7. Librarian: Let me see if I can determine the coverage of the database. I don't know if it covers southeast asian newspapers.
8. **Person Name: It should.**
9. **Person Name: is the service set up so that only a certain amount of people can access it at one time? that could be my problem.**
10. **Person Name: [Item sent - News & Newspapers (Univ Libraries)] http://www.lib.Univ.edu/online/news.html**
11. [,. . .]
12. Computer response: [User - has disconnected]
13. Librarian: I'm not sure what the connection problem is either. I just logged out of it. Try and see if you can take my place. Where are you located?
14. Note to staff: COMP-Ref [librarian - user has closed this session]

As previously stated, transcripts such as D-transcript #202555 (lines 4-6, 9, 16) containing missing speakers were also eliminated from the study.

Transcript #202555
STATUS: UNIV Undergraduate

1. User: hi. im in econ 20b and i have to print notes using the library website. i found his notes but for some reason when i press print nothing comes out. can i not pritn from the library website or do i actually need to go to the library to print his notes or is there anyway that it coudl just be printed out already so i could just buy it?
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [- will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. **Hello> Are you in the Library on the first floor next to the Reference Desk?**
5. **I am not sure where you are on the library web page. What is the URL or how did you get there?**
6. **I can check where you are with my computer and see if I get the same result.**
7. User: ok let me see if i can get there again
8. User: i went to the library services
9. **[Page sent - Library Services (Univ Libraries)] http://www.lib.univ.edu/services/services.html**
10. [. . .]
11. User: and just clicked on course name under course reserves
12. User: and put economics 20b
13. [Page sent - Reserve List Search: by Course Name] http://OPAC Name.lib.univ.edu/search/r
14. User: no thats it
15. User: thanks
16. **Good bye. And thanks for your patience and persistence.**
17. Computer response: [patron - has disconnected]
18. Note to staff: COMP-Dir [- user has closed this session] Note no librarian label in some places

A few transcripts were removed from the study because nothing was listed in the status area of the transcript, which made it impossible to determine whether the information seeker was a student or not, as below in D-transcript #99163:

D-Transcript #99163

1. User: how do i cite a webpage on a bibliography
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.].
4. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question... Librarian: there are a few examples depending on the style guide you are using...
5. User: oh where can i look
8. Librarian: APA, MLA, or Turabian...
9. [. . .]
10. Librarian: If not, click on the END CALL button at the bottom of your chat screen. We will be disconnected and you will then see the URLs (web addresses) of the sites

we visited. You can click on any of them to get back to those pages, or click on your browser's print button to print out the list of URLs.

11. Librarian: thanks for calling, call back if you need more help.
12. Note to staff: COMP-Ref [librarian - user has closed this session]

A number of discards were transcripts of tests or training sessions, such as D-transcript #958504 (line 2-4, 13). For a variety of reasons, librarians conducted numerous tests on the chat software. According to the study's informant, tests are conducted "to simply get a feel for the software and get use to chatting... page pushing, etc." and to make sure features such as co-browsing and Web page pushing are working properly. Tests also are performed to investigate changes to the chat software or library computers. Tests are done determine whether co-browsing/escorting can be done in certain databases, pdf documents, or pop-up windows:

D-Transcript #958504

1. Category: UNIV
2. **Resolution Code: TEST**
3. **QUESTION: test**
4. **User: Test**
5. Computer response: A librarian will be with you in about a minute.
6. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
7. User: hello?
8. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
9. Librarian: [Page sent - OPAC] http://opac.lib.univ.edu
10. User: [Page sent] http://opac.lib.univ.edu/screens/search_number.html
11. User: [Page sent] http://opac.lib.univ.edu/search/c
12. Librarian: [Page sent] http://www.cdlib.org/collections/
13. **Librarian: note to staff: TEST**
14. Computer response: [librarian - user has closed this session]

A number of transcripts contain little or no interaction. Limited dialogue is seen below in D-transcripts #173359, #219389, #1341361, and #21541. For example, D-transcript #173359 (lines 4-11) illustrates a user in a chat reference session alone, presumably clicking on Web pages based on the *page sent* and *item sent* labels preceding URLs. Although transcripts containing these labels include the *user question*, they are deficient in dialogue between user and librarian; so have been excluded from the study:

D-Transcript #173359
STATUS: Univ Undergraduate (series of Web page pushing)

1. User: I need some help finding a journal article.
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]

4. **User: [Item sent - Article Databases (Univ Libraries)] http://www.lib.univ.edu/online/databases.html**
5. **User: [Item sent - Home Page (Univ Libraries)] http://www.lib.uci.edu/**
6. **User: [Item sent - Title Search] http://opac.lib.univ.edu/search/t**
7. **User: [Item sent - University name /All Locations] http://antpac.lib.univ.edu/search/t?SEARCH=infancy**
8. **User: [Item sent - University Name /All Locations]http://antpac.lib.univ.edu/search/tinfancy/tinfancy/1,19,29,E/2exact&FF=tinfancy&1,8**
9. **User: [Item sent - University Name /All Locations] http://opac.lib.univ.edu/search/tinfancy/tinfancy/1,19,29,E/frameset&FF=tinfancy&8,,8**
10. **User: [Item sent - University Name /All Locations]http://opac.lib.univ.edu/search/tInfancy+(Online)/tinfancy+online/-5,-1,0,E/2browse**
11. **User: [Item sent - Ingenta: Content Not Found] http://www.ingenta.com/journals/browse/erlbaum/in**
12. User: hello?
13. Note to staff: LOST-Ref [librarian - user has closed this session]

Moreover, *page sent* and *item sent* transcripts indicate why the informant stated that transcripts containing these labels do not always indicate the presence of co-browsing/escorting during the chat reference session, even though there appears to be no other way to indicate co-browsing/escorting. Thus, all transcripts containing *page sent* and *item sent* meeting the research criteria were isolated for the sample pool. The purpose of doing this was to obtain transcripts containing co-browsing/escorting to ensure that they were sufficiently represented.

In other transcripts lacking user-librarian interaction, librarians are seen alone talking in sessions, excluding the user question that was composed prior to connecting to the chat reference service; see D-transcript #219389 (lines 4-9). In this category of discards, many users appeared to leave sessions prior to the librarian returning to the session, as seen by the librarian's response "Are you still there?" in line 9 below:

Transcript #219389
STATUS: Univ undergraduate

1. User: If I want to use the article databases, I have to use campus computers? like at the SciLib?
2. Computer response: A Librarian will be with you in about a minute.
3. Computer response: [Librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
5. **Librarian: You can use remote access to the article databases which will prompt you for your UNIVnet ID...**

6. **Librarian: These are the instructions to connect from off campus....**
7. **Librarian: [Page sent] http://www.lib.univ.edu/services/how/connect.html**
8. **Librarian: Is there anything else?**
9. **Librarian: Are you still there?**
10. Computer response: [User - has disconnected]
11. Computer response: [user has closed this session]

D-transcript #1341361 (line 10) shows another example of limited dialogue. This time it is the user who only commits one speaking turn throughout the entire chat reference session. Thus, this and similar transcripts were excluded from the study because the range of verbal interaction, which provides much of the context for understanding these transcripts, is minimal.

D-Transcript #1341361
STATUS: Univ Undergraduate

1. User: Hi! I'm taking ICS 131 and I'm required to download articles from Communications of the ACM. How can I find these articles?
2. Computer responses: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
5. Librarian: You can find a link to the online version through [the OPAC],
6. Librarian: our online catalog...
7. Librarian: [Page sent - OPAC] http://opac.lib.univ.edu
8. librarian: There is a link to [the OPAC] on our homepage, too.
9. librarian: Just do a title search for "communications of the ACM" and it will come right up
10. **User: Let me do it now**
11. Librarian: Great! Let me know how it goes...
12. Computer response: [patron - has disconnected]
13. Librarian: note to staff: COMP-Ref
14. Computer response: [librarian - user has closed this session]

Transcript #21541 (line 4-6) below includes a user alone in the chat reference session, saying “hello?” as though s/he is uncertain as to whether someone is there. Again, this and similar transcripts were omitted from the study.

Transcript #21541
STATUS: UNIV Graduate

1. User: Hi, I'm an alumni. I'd like to know how to reserve a book.
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. User: [Item sent - OPAC Web/Univ Libraries Public Access Catalog] http://opac.lib.Univ.edu/
5. User: hello?
6. User: hello?

7. Computer response: [User - has disconnected]
8. Note to staff: WCS-GONE [Person name - user has closed this session]

APPENDIX B: CODING SCHEME

LIST OF CODES

(1) INITIATION
- **(1 1) Greetings**
- **(1 2) Information Need**
  - (1 2 1) Can't Determine

(2) NEED CHANGE

(3) DIGITAL COLLABORATIVE STRATEGIES/FACILITATORS
- **(3 1) Confirming/Acknowledging**
  - (3 1 1) Information Received
  - (3 1 2) Follows Librarian
  - (3 1 3) Other
- **(3 2) Sending URLs**
  - (3 2 1) Page Pushing
  - (3 2 2) Pasted-In URLs
  - (3 2 3) Other
- **(3 3) Co-browsing/Escorting**
- **(3 4) Browsing**
- **(3 5) Educational Related**
  - (3 5 1) Guidance
  - (3 5 2) Instruction
  - (3 5 3) Demonstration
    - (3 5 3 1) With Co-browsing/Escorting
    - (3 5 3 2) Without Cobrowsing/Escorting
    - (3 5 3 3) Can't Determine
  - (3 5 4) Can't Determine
- **(3 6) Scripted Response**
- **(3 7) Abbreviations/Emoticons**
- **(3 8) Asking Questions**
- **(3 9) Other**

(4) PSYCHOLOGICAL
- **(4 1) Psychological/RUSA Behavior**
  - (4 1 1) Approachability
  - (4 1 2) Interest
    - (4 1 2 3) Formality and Pacing
    - (4 1 2 4) Interest/Other
  - (4 1 3) Follow-up
  - (4 1 4) Searching
- **(4 2) Psychological/Affective Dimensions**
  - (4 2 1) Gratitude
  - (4 2 2) Welcome, Non-greeting
  - (4 2 3) Successes

(4 2 4) Support and Encouragement
(4 2 5) Apologizes
(4 2 6) Readiness
(4 2 7) Dislikes/Failures

(4 3) Psychological/Other

(4 3 1) Corrects Self
(4 3 2) Repetition
(4 3 3) Repeat User
(4 3 4) Expectations

(3 11 6) Can't Determine

(5) BARRIERS

(5 1) Forgetfulness, Mistakes

(5 2) Technology Related

(5 2 1) Disconnections/Errors, Freezing
(5 2 2) Software/Computer, Login
(5 2 3) Navigation/Viewing
(5 2 4) Time factors
(5 2 5) Printing
(5 2 6) Other

(5 3) Searching

(5 4) Access/Availability

(5 5) Can't Determine

(6) TERMINATION

(6 1) Normal Closing

(6 1 1) Goodbye

(6 2) Evaporation

(6 3) Abnormal Closing

(6 4) Can't Determine

(7) NEED RESOLUTION

(7 1) Resolved

(7 2) Referrals

(7 3) Unresolved

(7 4) Can't Determine

(8) /LOGISTICS

(8 1) Begin Time
(8 2) End Time

CODING SCHEME

(1) INITIATION

Represents the beginning of a digital reference session; thus the information need is presented, typically, as a question, problem statement, or the like. Also, users and librarians may exchange greetings such as hello, hi, and the like.

(1 1) Greetings

User and/or librarian say(s) *hello, hi*, etc. as a form of greeting during initial phases of the interaction.

(1 2) Information Need

Represents some uncertainty provoking the user to seek information. Typically presented to the digital reference service in the form of a question or problem statement.

Examples: Could you tell me how to find . . . do you have information on . . . can you tell me where is . . . please help me find . . . how do I find . . .where is . . . etc. Some information needs may begin with statements such as: I need to find . . . I am looking for information . . . I want the book . . . I am trying to find . . . etc.

(1 2 1) Can't Determine

(2) NEED CHANGE

User need varies in some way. Entails user asking other questions pertaining to following the original need or
asking different questions from original need.

(3) DIGITAL COLLABORATIVE STRATEGIES/FACILITATORS

Are strategies users and librarians use to enhance or support the digital reference interaction. Include what participants do or say during the interaction.

(3 1) Confirming/Acknowledging

Confirming, disconfirming, and acknowledging statements such as yes, no, ok, and the like, usually following a question by user and/or librarian.

(3 1 1) Information Received

User indicates whether s/he received, can see, or is at the Web page sent via URL pushing or via URL pasted-in by the librarian, or user indicates s/he can see some content on the Web page sent.

(3 1 2) Follows Librarian

User indicates that s/he follows or understands what the librarian is doing or saying during the digital reference interaction. Sometimes indicated by remarks such as "I see."

User indicates that s/he follows some directive given by librarian; user says s/he clicked on, browsed, scrolled the web page sent, etc.

(3 1 3) Other
Includes things that don't fit in any of the other confirming/acknowledging categories. May include *yes, no, ok*, or other utterances by user and/or librarian.

(3 2) Sending URLs
URLs sent to and received by participants during digital reference interactions. Includes URL pushing and pasted-in URLs.

(3 2 1) Page Pushing
Represents URLs sent via the Internet browser or sent via clicking on hyperlink in Web page by user and/or librarian during the digital reference interaction. These URLs include page sent or item sent preceding the URL.

(**3 2 2) Pasted-In URLs**
URLs sent by one participant to the other. The participant generally sends the URL by typing or pasting it into the chat text box. These URLs are not preceded by "page sent" or "item sent."

(3 2 3) Other
User or librarian refers to or discusses sending or pushing URLs, Web pages, or the like without actually sending the page or URL itself.

(3 3) Co-browsing/Escorting
User and/or librarian indicate(s) or suggest(s) the use of co-browse/escort features. During this process the initiator of co-browse/escort sometimes say things such as "let me show you."

(3 4) Browsing
Librarian and/or user refer(s) to seeing content or features on Web page or its interface. Includes reference to viewing results from searches.

(3 5) Educational Related
Includes guidance, demonstrations, and instruction.

(3 5 1) Guidance
Librarian provides general information that points or directs users to specific resources or services (e.g., where to locate, who to contact., etc.)

(3 5 2) Instruction
Librarian defines or conceptualizes something pertaining to the system, its resources and/or services. This is the *why* or explanation pertaining to these. Here, the librarian does more than just point or help the user to navigate. S/he may make some value or *if-then* statement regarding the system, resource, or services.

(3 5 3) Demonstration
Librarian outlines a series of steps or gives directives to assist the user on how to search, access a resource, complete an ILL and renewal forms, etc. Demonstrations may be visual or non-visual.

(3 5 3 1) With Co-browsing/Escorting
Using escorting features, the librarian describes, as user follows along, how to perform tasks such as searching, completing ILL and renewal forms, and so forth.

(3 5 3 2) Without Co-browsing/Escorting
Without using escorting features, the librarian, sometimes pushing pasted-in URLs to user, describes how to perform tasks such as searching, completing ILL and renewal forms, and other types of tasks. Here, users sometimes follow by opening links to pasted-in URLs and viewing them based on librarian's description.

(3 5 3 3) Can't Determine
Cannot determine whether demonstrations are visual or non-visual.

(3 5 4) Can't Determine

(3 6) Scripted Response
Pre-generated messages sent by the system or librarian, usually appearing near or at the end of a digital reference session.

(3 7) Abbreviations/Emoticons
Symbols or icons such as :-) (smiley face), abbreviations such as LOL (laughing out loud), BTW (by the way) communicated by user and/or librarian.
Example: User says, "this is a great service :-)"

Does not include abbreviations such as ok, ILL, Lib, OPAC,, IP, univ, ID, etc

(3 8) Asking Questions
Questions asked by user and/or librarian during the digital reference interaction; does not include the initial information need.

(3 9) Other
Includes strategies not fitting in the other collaborative/facilitator categories

(4) PSYCHOLOGICAL
Includes affective and behavioral dimensions of user and librarian.

(4 1) RUSA Behavior
Codes the librarian's application of various behaviors appropriate for facilitating the chat reference process. This category includes the codes *approachability*, *interest, searching*, and *follow-up*.

(4 1 1) Approachability
Librarian attempts to develop rapport or warmth with user. For example, librarian greets user with *hello* or *hi* and/or refers to user by name during the initial digital reference interaction.

(4 1 2) Interest
Librarian shows interest in the user. For example, s/he conducts a reference interview or shows evidence of listening.

(4 1 2 3) Formality and Pacing
Librarian paces the interaction by asking the user to hold on and by letting the user know what is being done during the digital reference process.

(4 1 2 4) Other
Includes questions asked to clarify information needs (the reference interview) and other types of interest shown by the librarian not fitting in the formality and pacing subcategory.

(4 1 3) Follow-up
Librarian asks whether s/he has fully answered user's need, and/or encourages user to return to the digital reference service.

(4 1 4) Searching
Librarian indicates s/he is searching or checking the OPAC, a database, search engine, etc. to find books, articles, or other items. This also includes discussions of search results.

(4 2) Affective Dimensions
Expressions representing feelings, attitudes, or emotions.

(4 2 1) Gratitude
Expressions of appreciation e.g., *thanks, thank you, welcome*, etc.

(4 2 2) Welcome, Non-greeting
A response generally made to *thanks, thank you*.

Note: Only code here when the word welcome is not a greeting. When welcome is a greeting, use the opening greeting code under initiation.

(4 2 3) Successes
User makes a positive value statement concerning the answer received. For example, s/he indicates "this is what I wanted," "This is 'perfect,'" and the like.

(4 2 4) Support and Encouragement
Represents expressions of support such as encouragement, assurance, empathy, hopefulness, inspiration and the like.

(4 2 5) Apologizes
User and/or librarian make expressions of excuse, apologies, regret and the like.

(4 2 6) Readiness
Refers to two types of behaviors: 1) readiness to interact; and 2) immediacy of need (time factor) and other time factors.

(4 2 7) Dislikes and Failures
Includes unfavorable comments expressed by user and/or librarian during the digital reference interaction; or includes negative value judgments concerning answer(s) found. Includes expressions made pertaining to search results.

(4 11) Other
Emotions and attitudes not covered by the codes above.

(4 11 1) Corrects Self
Makes correction of prior statement or act.

(4 11 2) Repetition
Repeating expressions, statements, or questions during the digital reference interaction.

(4 11 3) Repeat User
User or librarian indicates in some way that user has used the digital service before. User Says “the last time I was here,” “hello again, etc.,” or librarian says something like "you're back" or "I lost your previous call."

Also includes users who have been disconnected and have returned to the service.

(4 11 4) Expectations
User anticipates concerning the service, its resources, and the like.

(4 11 6) Can't Determine

(5) BARRIERS

(5 1) Forgetfulness, Mistakes
Barriers related to forgetfulness, mistakes, confusion, uncertainty, etc. concerning meeting user needs during digital reference interactions.

(5 2) Technology Related
Difficulties related to *disconnections/errors, freezing; software/computer, login; navigation/viewing; time factors; printing*; and *other* types of barriers. Note that there can be overlap in coding between these subcategories.

(5 2 1) Disconnection/Errors, Freezing
Involves barriers such as user and/or librarian disconnection from the digital reference service; computer freezing or displaying error messages during the digital reference interaction.

(5 2 2) Software/Computer, Login
User and/or librarian indicate(s) that the barrier relates to the digital reference software itself (e.g,co-browse/escort, databases, OPAC); the computer which participants are using or trying to access during the interaction; login/off and related types of barriers.

(5 2 3) Navigation/Viewing
Refers to barriers related to navigations e.g., Web pages, links, URLs, etc.

(5 2 4) Time Factors
Involves barriers such as system, computer, and related delays.

(5 2 5) Printing
Involves barriers related to printing.

(5 2 6) Other

(5 3) Searching
Refers to mistakes and other constraints experienced by users or pointed out by librarians during searching of the OPAC, databases, and related resources.

(5 4) Access/Availability
Resource is not available online from the digital reference service or available from inside the host library.

(5 5) Can't Determine
Can't determine (e.g., overlap between another code) or does not fit in any of the other "barrier" categories.

(6) TERMINATION
Refers to the closing of a digital reference session.

(6 1) Normal Closing
Indications by user, librarian, and/or system that the digital reference session is closing or has closed by participant(s). Sometimes indicated by system responses such as "user has closed session."

(6 1 1) Goodbye

Participants say *bye, goodbye, have a good day*, or follow similar closing protocol during the closing of the digital reference session.

(6 2) Evaporation

User leaves an ongoing digital reference session without prior notice (e.g., by saying bye, goodbye, thanks etc.) to the librarian, thus leaving the librarian uncertain about the status of the interaction.

Note: Although the system typically indicates that the user has disconnected during evaporation, because the librarian does not receive a response from the user, s/he is uncertain whether the user is still at his or her computer.

Example:

- Librarians do not hear from user after long interval and asks, "Are you still there?" but does not receive a response. Sometimes librarians use a question mark as a means of inquiring about the user online status. Following the librarian as speaker label, one would see the following:

- Librarian: ?

(6 3) Abnormal Closing

Refers to an abrupt disconnection of an on-going digital reference session. Typically technologically related, resulting in the termination of either or both user or librarian from the session. Also refers to early terminations by librarians before user is ready for session to end.

Note: This type of termination might also be considered as a barrier to the digital reference interaction.

(6 4) Can't Determine

Terminations or disconnections from the service by user and/or librarian, which cannot be clearly assigned to any of the other termination subcategories.

(7) NEED RESOLUTION

Represents whether user receives an answer to his or her information need prior to disconnecting from the digital reference service. This includes referrals to other services and/or resources rather than an explicit answer to the need itself.

(7 1) Resolved

User indicates need fulfilled. Librarian notes (scripts) indicate completion of transaction but note must correspond with user indication of need fulfilled.

(7 2) Referrals

Librarian refers user to resources or services, such as, ILL, other people, agencies, libraries, databases, etc. for the answer to user information need.

(7 3) Unresolved
User leaves the digital reference service without receiving an answer to information needs. This does not include referrals to other services, resources (includes contact persons). Unresolved needs generally result from abnormal termination of user from service. Sometimes librarians indicate that they are unable to find item.

(7 4) Can't Determine
Cannot determine whether user need was resolved or not.

(8) LOGISTICS
Refer to the initiation and termination times and the date for users interacting in digital reference sessions with librarians.

(8 1) Logistics/Begin time
Refers to the time user need submitted to the chat reference service. Generally, this time is posted under the initial user need.

(8 2) Logistics/End time
Refers to the time user disconnects from the digital reference service. If "user disconnect" time cannot be determined from the computer script for session, then use the time posted for the last participant in the session, whether it is the user or the librarian. Disconnect times are generally indicated by system scripts such as:

"patron - has disconnected," "user has closed this session," or "user - librarian has closed session."

APPENDIX C: MEMO REPORT

NODE CODING REPORT

Node: /Dig collabor strategies~Facilitators/Browsing
Treenode address: (3 4)
Created: 3/8/2005 - 10:34:58 PM
Modified: 5/2/2006 - 12:15:25 AM
Description:
Librarian and/or user refer to seeing content or features on Web page or its interface. Includes reference to viewing results from searches.

Documents in Set: memo_Browsing
Document 1 of 7 #161541 - Memo
Passage 1 of 1 Section 0, Para 2, 76 chars.

2: When librarian says "check to see" this could mean "searching" or "browsing"

Document 2 of 7 #168307 - Memo
Passage 1 of 2 Section 0, Para 2, 253 chars.

2: Used formality pacing because librarian tells user what she is going to do. In addition, I coded co-browsing also when librarian ask user did s/he see the page that s/he (librarian) sent. This seem quite obvious that co-browse feature was implemented.
3:
Passage 2 of 2 Section 0, Para 4, 302 chars.

4: It is interesting to note that the URLs themselves tells much about what is going on during the interaction. For example, some urls have error written in them, indicating a technological barrier. Other URLs include the words search(es), browse. Does this mean that these activities have taken place?

Document 3 of 7 #296934 - Memo
Passage 1 of 1 Section 0, Para 8, 48 chars.

8: i see it says it's sent, but nothing p oppped up

Document 4 of 7 #498961 - Memo 3
Passage 1 of 1 Section 0, Para 3, 320 chars.

3: Upon sending page to user via co-browse/escort features, librarians tend to ask user "do you see" the page or something to this effect. This in turn, is followed by a user response of "yes"

"no" or something else. Thus, there tends to be some norm regarding the act of co-browsing/escorting on the part of participant.

Document 5 of 7 #540584 - Memo
Passage 1 of 1 Section 0, Para 2, 1683 chars.

2: This scripted passage in which the librarian tells the user what button to click on to disconnect from the digital reference system is a good example of multiple meanings found in some passages. This explains why intercoder reliability as discussed by Krippendorf, Lombard, and other researchers is not very useful in validating the coding scheme for interpretative studies. Intercoder reliability as discussed by these authors tend to be more useful for validating coding schemes using discrete or more structured terminology, which is less interpretative. That is, codes contain definitions that are structured or discrete in that they are readily identified with little or no interpretation (e.g, instances of the word "hello", "goodbye" "thank you") discussed in transcripts. Such terms can readily be identified within the phenomenon. However, for interpretative coding such as the aforementioned passage, I've used about five codes to depict meanings within the passage. Someone else following directions of the coding scheme and coding line by line could use the definitions identify such meanings within the passage, but how much of the line would one person highlight and code as oppose to someone else for the respective code? How much of the passage coded by a coder is dependent on the coder's understanding of the phenomenon, his or her theoretical or philosophical understanding, his or her knowledge of the literature, and the likes (as expressed by researchers at the Strategies Conference e.g., Pat Blazey). Because of such understandings or lack of it, it is not unusual that coders of interpretative data see things differently and thus, code differently.

Document 6 of 7 #664009 - Memo
Passage 1 of 1 Section 0, Para 2, 377 chars.

2: Interesting, after supposedly linking user to co-browse/escort, the librarian first checks to see if user can see the Library's Home page, presumably the page the librarian has pushed and currently viewing. In many of the past sessions, librarians pushed pages and began the task of searching or showing user the page without first seeing if user can view page from their end.

Document 7 of 7 Union 2 - Memo
Passage 1 of 1 Section 0, Paras 4 to 17, 2060 chars.

4: Browsing and co-browsing seem to be depicted by utterances such as "see" and "I see." So I teased out such passages by conducting a Boolean text search on these words for previously coded transcripts. This search retrieved over 200 passages with *I see* **OR** versions of *see*. Obviously, all retrieval results did not depict "browsing" or "co-browsing." A number of such passages omitted for these codes during original coding were included in search results and coded. By the same token, irrelevant passages retrieved during search results were not labeled at these codes.
5:
6: Careful examination of search retrieval was necessary, sometimes in addition to other contexts of passages preceding or following the retrieved passage, because I also found "I see" to mean

something else, e.g. “follows librarian,” and not always browsing. Here again, context is important in assigning meaning to chat reference interactions in transcripts.
7:
8: This particular use of the analysis tools has allowed me to re-examine passages that I’d previously missed that depict browsing or co-browsing. The search analysis allows the researcher to re-examine and compensate for some things missed during the initial review and coding of data. Thus, the search helps the researcher check for completeness and reliability in coding (Gibbs p.104).
9:
10: Note: expressions like “let me see” was not coded as *browsing* or *co-browsing*.
11:
12: Show [from analysis search results]
13: During the review and analysis of the “see” and “I see” search result, I noticed the word “show” sometimes also depict browsing or co-browisng in transcripts. So I also conducted a text search on “show.”
14:
15: A review of passages from this search result, however, indicates that “show” tends to depict the “co-browsing” aspect of the interaction. That is, librarians tend to say “I can show you...” when they plan to implement co-browsing features during chat reference interactions.
16:
17: Gibbs, Graham R. 2002. “Searching for text.” *Qualitative Data Analysis Exploration with NVivo*. Philidelphia: Open University Press.

APPENDIX D: APPLICATION OF THE CODING SCHEME

CODING SCHEME AND APPLICATION

An analysis of chat transcripts from a Northwestern University library for the periods of September 2002 to May 2004 shows several themes or patterns providing insight into the experiences of users during their collaborative (Web page pushing and co-browsing/escorting) chat reference encounters. Categories below represent interactions from the digital reference service for this University and represent broad codes depicted in the coding scheme. Additionally, concepts from the cognitive prospective of library and information science (LIS) encompassing these broad categories are included below in parenthesis:

- Initiation (cognitive) and opening greeting (affective);
- need change (cognitive);
- digital collaborative strategies/facilitators (cognitive, actional/physical);
- psychological (affective, cognitive);
- barriers (affective, cognitive, actional/physical) and
- termination (cognitive, actional/physical).

Other codes providing information concerning these interactions include:

- need resolution; and
- logistics.[35]

[35] Although this concept did not have anything to do with the cognitive perspective concepts, it was coded in order to obtain average session length count for the social interaction segment of the "Settings" section of the dissertation.

LIST OF CODES

(1) INITIATION
- **(1 1) Greetings**
- **(1 2) Information Need**
  - (1 2 1) Can't Determine

(2) NEED CHANGE

(3) DIGITAL COLLABORATIVE STRATEGIES/FACILITATORS
- **(3 1) Confirming/Acknowledging**
  - (3 1 1) Information Received
  - (3 1 2) Follows Librarian
  - (3 1 3) Other
- **(3 2) Sending URLs**
  - (3 2 1) Page Pushing
  - (3 2 2) Pasted-In URLs
  - (3 2 3) Other
- **(3 3) Co-browsing/Escorting**
- **(3 4) Browsing**
- **(3 5) Educational Related**
  - (3 5 1) Guidance
  - (3 5 2) Instruction
  - (3 5 3) Demonstration
    - (3 5 3 1) With Co-browsing/Escorting
    - (3 5 3 2) Without Cobrowsing/Escorting
    - (3 5 3 3) Can't Determine
  - (3 5 4) Can't Determine
- **(3 6) Scripted Response**
- **(3 7) Abbreviations/Emoticons**
- **(3 8) Asking Questions**
- **(3 9) Other**

(4) PSYCHOLOGICAL
- **(4 1) RUSA Behavior**
  - (4 1 1) Approachability
  - (4 1 2) Interest
    - (4 1 2 3) Formality and Pacing
    - (4 1 2 4) Interest/Other
  - (4 1 3) Follow-up
  - (4 1 4) Searching
- **(4 2) Affective Dimensions**
  - (4 2 1) Gratitude
  - (4 2 2) Welcome, Non-greeting
  - (4 2 3) Successes
  - (4 2 4) Support and Encouragement

(4 2 5) Apologizes
(4 2 6) Readiness

(4 3) Psychological/Other

(4 3 1) Corrects Self
(4 3 2) Repetition
(4 3 3) Repeat User
(4 3 4) Expectations
(3 11 6) Can't Determine
(3 11 7) Dislikes/Failures

(5) BARRIERS

(5 1) Forgetfulness, Mistakes

(5 2) Technology Related

(5 2 1) Disconnections/Errors, Freezing
(5 2 2) Software/Computer, Login
(5 2 3) Navigation/Viewing
(5 2 4) Time factors
(5 2 5) Printing
(5 2 6) Other

(5 3) Searching

(5 4) Access/Availability

(5 5) Can't Determine

(6) TERMINATION

(6 1) Normal Closing

(6 1 1) Goodbye

(6 2) Evaporation

(6 3) Abnormal Closing

(6 4) Can't Determine

(7) NEED RESOLUTION

(7 1) Resolved

(7 2) Referrals

(7 3) Unresolved

(7 4) Can't Determine

(8) /LOGISTICS

(8 1) Begin Time
(8 2) End Time

DEFINITION AND APPLICATION OF CODES

Codes, their definitions, and applications are discussed below as they appear in the above *list of codes*. With respect to transcripts, the reader is reminded that the unit of analysis for these is the message segment produced from each speaking turn, which is coded line by line in this dissertation. A single message segment or line may have multiple codes depending on what is happening within the context of a particular message segment. In addition, the codes *other* and *can't determine* are used to tag texts not fitting in the coding categories or are used to tag ambiguities for *initiation, need change, digital collaborative strategies, barriers, psychological, termination, need resolution, and logistics*.

Initiation

The category ***initiation*** included the *greeting* and the *information need* codes. Observations of transcripts indicated that at the onset of chat digital reference interactions participants engaged in *greetings*, including *scripted responses* (see digital collaborative strategies). Although actual interactions between the user and the librarian do not typically begin until the librarian utters a greeting or asks a question, the *information need* is also included as part of initiation because it is the reason for the interaction in the first place.

Librarians sometimes use ***greetings*** to initiate interactions. They use greetings such as *hello*, *hi*, and *scripted responses* such as "Welcome to Ask a Librarian LIVE! I'm reading your question . . . ." Sometimes users reciprocate such *greetings* using similar expressions of warmth and friendliness. A few transcripts depict librarians greeting and addressing users by name during the interaction (transcript #1347443, line 6), a practice termed *addressivity* by Werry (1996).[36]

Typically, in face-to-face reference services, the reference interaction begins with the user's verbal presentation of the *information need*. Unlike face-to-face reference interactions, the initial digital reference interactions begin with a prompt from the librarian, which might be a

[36] Such names appear within transcripts but not as speaker headings; names appearing as speaker headings were discarded and were discussed in the sample isolation and preparation section of the dissertation.

greeting, question, or something else. Thus, such librarian prompts suggest a *readiness* to interact. Transcripts below are examples of *greetings*, which librarians sometimes used to initiate chat digital reference interactions.

Transcript #1347443 depicts the librarian *greeting* the user with *hi* (line 6), which results in the user saying *hello* (lines 8):

1. Transcript #1347443
2. STATUS: Writing 39C Student
3. **User: Do you have any Material on the Boy Scouts of America vs. Dale case? Or anyother**
    a. **material on the discrimination of homosexuals in the Boy Scouts?**
4. Computer response: A librarian will be with you in about 8 minutes.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. **Librarian: hi [Person name]...**
7. **Librarian: by material, what do you mean?**
8. **User: hello**
9. User: books, articles, newspapers
10. [. . .]

Transcript #1368239 shows the librarian *greeting* the user with a *scripted response* (line 4), which is not reciprocated by the user. The user joins the interaction only after the librarian comments, "I'm not sure . . . but I will help you find that out on the UNIV" (line 5-6):

1. Transcript #1368239
2. STATUS: UNIV Undergraduate
3. **User: what does it take to be a part-time student other than applying at the registrar? (i.e. amount of units, required signatures)**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or You will be disconnected.]
6. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
7. **Librarian: I'm not sure ... but I will help you find that out on the UNIV**
8. User: thank you
9. [. . .]

The code ***information need*** typically represents the user's purpose or goal for contacting the chat digital reference service in the first place. This need is presented to the service as a question or problem statement, reflecting a cognitive process on the part of the user. Users generally express these needs as questions or statements of need early on in the chat reference process as indicated above in lines 3 of transcripts #1347443 and #1368239.

Information need – Can't Determine coded transcripts whose initial need statement is difficult to determine, or when the initial need statement can not be determined. Transcripts #184957 and #86695 represent examples of this code. In transcript #184957 (line 3), the user presents a very vague statement of need when stating "I need help! Please :-):"[37]

1. Transcript #184957
2. STATUS: UNIV Undergraduate
3. **User: I need help! Please :-)**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. User: hello?
7. Librarian: You are so patient--I was answering your call in another window.
8. [. . .]

Transcript #86695 (line 3), also includes an ambiguous statement of need. However, it is obvious that the user is returning because s/he was disconnected. Like the above transcript, this transcript was coded with *can't determine* for the *information need:*

1. Transcript #86695
2. STATUS: UNIV Undergraduate
3. **User: I was disconnected..sorry.**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: No problem... are you on campus or using the proxy server?
7. User: On campus...sorry. When I click on the expanded link, this is the message that I see : Sorry -- InfoTrac is unable to give you the result you asked for. The specific message that describes the problem is There are no matching citations.

Need Change

Need change coded when the user's initial information need varies in some way. This entailed the user asking additional questions pertaining to the original need or asking different questions from original need.

Transcripts below provide examples of user needs that vary from the needs as originally submitted. In transcript #84031, the user initially submits a request for assistance in accessing

[37] Within the dissertation, line numbers begin at the transcript number, for example *transcript #86695*; therefore, initial need statements are generally found on line 3 of transcripts.

his or her pin number (line 3), but as the session proceeds the *need changes* to how to "access cdresearcher from home" (lines 3, 9):

1. Transcript #84031
2. STATUS: UNIV Undergraduate
3. **User: I forgot my pin number, so how do I find it out**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: I is easy to replace it....
8. Librarian: but you have to come in person to the Loan Desk of any of the UNIV libraries.
9. **User: okay thank you...onemore thing can i access cqresearcher from home? and if so what is the site?**
10. [. . .]

Some *needs change* when users ask new questions, presumably to help complete or fulfill their need. For example, at or near the end of the digital reference transaction when answers are provided, users sometimes ask where items are located in the library, on campus, in the city, or in other neighboring areas as seen in transcript #1222711. Here, the user requests journal articles containing statistical data on juvenile crime and curfew law (line 3-4). As the reference interaction proceeds and the librarian provides the answer, the initial *information need* changes when the user asks, "Are these [resources] located on campus?" (line 11):

1. Transcript #1222711
2. STATUS: Writing 39C Student
3. **User: where could I find empirical articles from journals in the library that report actual data collected from research?**
4. **User: my topic is juveniile crime and curfew laws**
5. Librarian: OK, that's a good one...
6. [. . .]
7. User: I think this is great
8. User: Just what I needed
9. User: one more question...
10. Librarian: sure!
11. **User: Are these located on campus?**
12. User: Yes, right
13. [. . .]

Digital Collaborative Strategies or Facilitators

During digital reference interactions users and librarians work cooperatively using a variety of strategies in order to support or enhance interactions. They employ strategies such as *confirming/acknowledging, sending URLs, co-browsing/escorting, browsing, educational related, scripted responses, abbreviations/emoticons*, *asking questions,* and *other* related strategies. These tactics are used to enhance or facilitate the digital reference interaction and are listed in the coding scheme as subcategories of *digital collaborative strategies/facilitators*.

Many of the subcategories for *digital collaborative strategies* represent the cognitive dimensions of information seekers. That is, during the digital reference process, participants in transcripts are seen engaging in thinking, problem-solving, decision-making, and related cognitive activities such as *asking questions, browsing, co-browsing/escorting,* searching, and the like. Hence, users interact with Web page content and other aspects of digital reference during their encounter with the service.

Confirming/acknowledging codes short verifying responses that confirm, disconfirm, or acknowledge statements or answers to questions during digital reference interactions. In doing so users and librarians generally make utterances such as *yes, no, ok,* and the like to indicate *information received, follows librarian, information usefulness,* and *other*:

- *Information received* depicts users confirming or disconfirming (using *yes, ok, no*, and the like) that s/he received, can see, or is at the Web page sent via page pushing or pasted-in activities.
- *Follows librarian* depicts users confirming or disconfirming (using *I see, yes, ok, no* and the like) that they follow or understand what the librarian is uttering or doing during the chat digital reference interaction.
- *Other* depicts confirming or disconfirming remarks by users and/or librarians in contexts not represented in any of the above *confirming/acknowledging* categories.

Transcript #89193 includes examples of digital reference interactions in which two of the above *confirming/acknowledging* contexts are used. In the transcript, *confirming/acknowledging* utterances are used to resolve the *information need* concerning the loan period for a book (line 3). The librarian says "I just sent you the page with the phone number . . . do you see it on your screen?" (line 13). The user responds "yes" (line 15)

(*information received*) to this statement, confirming that s/he has received or seen the specific information or item sent by the librarian via *URL pushing*:

1. Transcript #89193
2. STATUS: UNIV Undergraduate
3. **User: i was wondering what the loan period is on the book "bread givers" by anzia yezierska**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: Since the book is on reserve in the Gateway Study Center, you'd have to check with Reserves ...
8. **User: ok**
9. Librarian: Here is the contact information page:
10. Librarian: http://www.lib.Univ.edu/services/reserves/res-locs.html
11. Librarian: [Item sent] http://www.lib.Univ.edu/services/reserves/res-locs.html
12. User: is there a number i can call or do i have to stop by
13. **Librarian: I just sent you the page with the phone number ... do you see it on your screen?**
14. Librarian: If not I will resend ...
15. **User: yes**
16. User: thanks
17. User: ill call thme
18. **Librarian: No problem -- anything else I can help with today?**
19. **User: nope**
20. **Librarian: OK -- thanks for using our service!**
21. Computer response: [patron - has disconnected]

Follows Librarian codes situations in which utterances such as *yes, ok,* and the like are used to confirm or disconfirm that the user follows or understands what the librarian is explaining or doing during the digital reference interaction. Such confirming/acknowledging utterances are especially useful during *guidance, demonstration, instruction,* and s*earching* related activities as seen in excerpts from transcripts below for the *follows librarian* code:

- *yea i get why quotations are used now"!*
- *oh okay, i see;*
- *Ok, I think I got it ;* and
- *ok.. i see how this works. thank you very much..…* .

Other is a subcategory of *confirming/acknowledging* used to code text not fitting in any of the above *confirming/acknowledging* categories. Transcript #89193 provides an example of

the *other* code. Prior to closing interactions in the transcript, the librarian poses the *follow-up* question "anything else I can help you with today?" (line 18), and the user replies "Nope" (line 19), a disconfirming utterance.

Sending URLs codes passages involving *page pushing* and *pasted-in URL* activities**.** These activities generally entail the librarian and/or the user interacting with Web page content and technology. These activities involve the user and/or librarian sending URLs via: (1) clicking on links in the Web page(s), a *page pushing* activities that results in sending the whole Web page; or (2) typing or *pasting-in* the URL in the chat text box, a *pasted-in URL* activity that results in sending only the URLs. Thus, participants interact with the technology and page content by clicking on hyperlinks and by *browsing* and *co-browsing* Web pages.

Page pushing codes transcript passages involving librarians implementing co-browsing/escorting features, which entails inputting a URLs their browser to push whole Web pages to users' desktops. This feature also allows users to click on hyperlinks in pages, which in turn sends the whole Web page to link to librarians' desktop. URLs for these Web pages generally are represented in transcripts with *page sent* or *item sent* labels. These labels also serve as indicators that *co-browsing/escorting* features have been implemented. In such contexts, librarians generally let users know prior to *page pushing* that they will be implementing *co-browsing/escorting* features and that a Web page will open-up on their desktops. Transcript #92211 depicts how the URL pushing code is applied. In the transcript, the user wants to know where someone can recommend books to the library (line 3), and the librarian suggests someplace on the library's Web site. Although the librarian pushes the Web page to the user, the user has also apparently found the link on the library's Web site and clicked on it (lines 8-9); note that the *item sent* label precedes both *page pushing* in the transcript.

1. Transcript #92211
2. STATUS: UNIV Undergraduate
3. **User: Where can I make a recommandation for a book the UNIV libaray should have?**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: On the UNIV web Library website - see next message
8. **User: [Item sent - Libraries (Univ Libraries)] http://www.lib.Univ.edu/libraries/libraries.html**
9. **Librarian: [Item sent - Home] http://www.lib.Univ.edu/**

10. User: where should I go?
11. Librarian: As I go to different web sites, your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an
12. User: I'm ready, lead on
13. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
14. Librarian:
15. User: I'm here
16. Librarian: This is the web address
17. Librarian: http://www.lib.Univ.edu/acquire.html
18. Computer response: [patron - has disconnected]

Pasted-in, in contrast, codes *page pushing* coding. In these instances, transcript passages involve users and librarians sending URLs by typing or pasting them into the chat text box. Noticeably, *pasted-in* URLs are not preceded by *page sent* or *item sent* labels; thus only the URL is seen in the transcript (for example, http://www....). Transcript #13068 (line 10) below is an example of the user sending a *pasted-in URL* to provide the librarian the link for the ABC-CLIO database:

1. Transcript #13068
2. STATUS: UNIV Undergraduate
3. User: Humanities Core Student, Where do i locate the article I want to read from the America: History and Life search, (ABC-CLIO)?
4. Computer response: librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: Hi. Sorry about the delay. I had another question.....
8. User: no problem
9. User: i can send the link
10. **User: http://serials.abc-clio.com/active/go/ABC-Clio-Serials**
11. Librarian: You should now have the UNIV Libraries home page in front of you....I am going to walk you through the process of locating an American History and Life article.....
12. [. . .]

Another example of a *pasted-in* URL is seen in transcript #284395. The transcript depicts the librarian sending a *pasted-in* URL to answer a somewhat unfocused *information need*. The transcript indicates that the user is looking for books and journals on transportation demand analysis (lines 3, 7). After checking the library's resources, the librarian suggests that the user go to the library's OPAC, and sends an URL via the chat text box (lines 11, 15):

1. Transcript #284395
2. STATUS: UNIV Graduate

3. **User: Where do I find the transpotation engineering books anf journals?**
4. [. . .]
5. Librarian: Are looking for a particular title, or just the general topic?
6. User: denad analysis
7. **User: demand analysis**
8. Librarian: Ok, got it. Is that the title of a book or article?
9. User: are they in the main library
10. User: any book in that subject
11. **Librarian: Ok, hold a sec while I check.**
12. User: sure
13. Librarian: OK. Here' s what I suggest you do...
14. User: ok
15. **Librarian: Go to the [name of the] Online catalog (http://opac.lib.univ.edu) and do a KEYWORD search on this exact phrase:**
16. Librarian: "transportation and engineering" (no quotes)
17. [. . .]

Many transcripts show both users and librarians interacting with URLs either by *page pushing* or *pasting-in* activities (for example, Transcripts #92211). Above transcripts show either the user or the librarian sending URLs via the chat text box (*pasted-in* URLs), while transcript #135363 below shows both user and librarian *page pushing* to one another. This transcript shows the user needing assistance with electronic reserves (line 3) and the librarian providing *guidance* to the user while working on the *information need*. While providing the answer, the librarian essentially does not conduct a reference interview but simply provides an URL by sending a whole Web page via *page pushing* to answer the query (lines 12, 16-17, 20, 28). The transcript also shows the user *page pushing* to the librarian by following the librarian's directives to "type in the course name on the screen" and "click on searh" [sic] (lines 21-23). In addition, the user pushes another URL when s/he types in the name of the instructor in the search box and sends it (lines 26, 29). The transcript also shows an URL pushed by the librarian when s/he clicks on the link in the reserve list search: by instructor (line 28).

1. Transcript #135363
2. STATUS: Univ Undergraduate
3. **User: I am still having trouble accessing what I need from electronic reserve. Can you guide me through the step-by-step process?**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: you aga[]in
8. Librarian: To find materials at [the Univ], we need to use the [online] catalog.

9. User: why are our entire lives on the internet?
10. Librarian: I guess you're in the newer generation
11. Librarian: Anyway, be glad to walk you through
12. Librarian: first go to [OPAC].lib.univ.edu
13. Librarian: by the way, do you have a PIN number before I can walk you through
14. User: yes.
15. Librarian: ok
16. Librarian: [Item sent - OPAC Web/Univ Libraries Public Access Catalog] http://opac.lib.univ.edu/
17. Librarian: [Item sent - Reserve List Search Options] http://opac.lib.univ.edu/screens/search_reserves.html
18. Librarian: Do you see the OPAC Reserve screen on your side
19. User: yes.
20. Librarian: [Item sent - Reserve List Search: by Course Name] http://opac.lib.univ.edu/search/r
21. Librarian: Can you type in the course name on the screen
22. Librarian: click on searh
23. User: [Item sent - University /All Locations] http://opac.lib.univ.edu/search/r?SEARCH=Art+History+40B
24. Librarian: ok
25. Librarian: It looks like there is no e-reserve
26. User: no matches were found, but I seem to find what I am looking for when I type in the name of the instructor.
27. Librarian: how about search by the instructor
28. Librarian: [Item sent - Reserve List Search: by Instructor] http://opac.lib.univ.edu/search/p
29. User: [Item sent - University /All Locations] http://opac.lib.univ.edu/search/p?SEARCH=[Name]
30. Librarian: can you now put in your instructor's name
31. [. . .]

The ***Co-browsing/escorting*** code generally refers to librarians' implementation of co-browsing/escorting features to enable *page pushing* activities, which in turn enables simultaneous *browsing* of a Web page. The implementation of *co-browsing/escorting* features make it possible for a whole Web page to automatically open-up or display on the user's and/or librarian's desktop. This is made possible by the librarian sending an URL via his or her browser or by the user clicking on hyperlinks within Web pages; thus, these activities involve *page pushing*.

As previously noted, librarians generally initiate desktop sharing *co-browsing/escorting*. Typically, desktop sharing related *co-browsing/escorting* is used to demonstrate or instruct users on searching databases and the OPAC. Initially, this type of co-browsing was difficult to determine in transcripts; however, several patterns emerged that suggest desktop sharing *co-*

browsing/escorting during coding of transcripts. One pattern involves librarians making statements such as I *will show* as outlined below:

- *I'm going to try to connect to the database and **show you** the screens.*
- *While we're talking, I"m going to take us into BIOSIS and try some searches. let me **show you**...* [two lines combined].
- *OK, what I'm going to do is **show you** the database and how to search it. Hold on one second....*

A second pattern indicative of desktop sharing *co-browsing/escorting* involves librarians making *scripted* statements such as: *As I go to different web sites, your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an "item sent" message in the chat box. Ready?* A third pattern of *co-browsing/escorting* occurs when librarians ask or tell users about their screen changing after the librarian has sent a Web page. For example, users are told to "hold on just a moment and your page should change...." In a number of instances librarians explicitly tell users that they are going to escort, co-browse, or take over their browsers, saying things such as "I will need to try to take over your browser;" "I am goin I'm going to try escorting you...." Librarians also tell users to watch what they do or to watch their arrow. Librarians even tell users that they are able to see their screens; or say things like "let's search together." To circumvent problems during co-browsing, the librarian tells the user in one session, "Great, so that we don't develop a problem, please let me click and I will let you watch..[]."

Librarians usually follows-up the same pattern of confirming whether users are able to see pages sent via *co-browsing/escorting*. After pushing a Web page to the user in transcript #498961, the librarian follows-up by asking the user if s/he is able to see the page. The user asks, "where's the index," which is followed by the librarian implementing *co-browsing/escorting* features, thus alerting the user of what to expect (lines 8-9). The librarian also pushes two pages pertaining to databases and two pertaining to dissertations (lines 14, 16, 18-19). After pushing these pages, the librarian asks, "Do you see the search screen now?" (line 21):

1. Transcript #498961
2. STATUS: UNIV Undergraduate
3. User: Where do I look for a specific dissertation? author Maria Raquel Casas/Yale 1997

4. [. . .]
5. User: Is there a website? for dissertations
6. [. . .]
7. Librarian: let me show you the index...
8. **User: Where do I find index**
9. **Librarian: As I go to to the web site , your browser will show you the same page that I see (the page on the left-hand side of your screen will change). Also, you will see an "item sent" message in the chat box. Ready?**
10. User: yes
11. Librarian: the index is called "Digital Dissertations"...
12. Librarian: and we can find it under "Article Databases"...
13. Librarian: I'll click there...
14. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases.html**
15. Librarian: now, i'll click on "D"...
16. **Librarian: [Page sent] http://www.lib.univ.edu/online/databases_d.html**
17. Librarian: and then on "Digital Dissertations"
18. **Librarian: [Page sent] http://wwwlib.umi.com/dissertations/gateway**
19. **Librarian: [Page sent] http://wwwlib.umi.com/dissertations/search**
20. Librarian: and then on "Enter"
21. **Librarian: Do you see the search screen now?**
22. User: yes
23. Librarian: great. i'll enter "casas" in the first box...
24. [. . .]

Some sessions consist of users requesting that librarians show them how to search specific databases or requesting to be taken back to a particular screen. In one instance, for example, the user tells the librarian, "sorry, 'co-browsing not supported' on my computer." Other examples of users seeking search related assistance by asking librarians *to show* them are provided below:

- *Yeah if you could show me how to begin my search in biosis would be great*
- *can u also show me how to find articles in expanded academic?*

Thus, activities involving collaborative tools make *co-browsing* and *browsing* possible during the chat digital reference interaction.

In many sessions, librarians make statements pertaining to ***browsing***. For example, they often ask users if they are able to see specific content or objects on the library's Web site or OPAC. As previously discussed, the *information received* subcategory for *confirming/acknowledging* also indicates browsing, when users respond *yes* to librarians' inquiries about seeing or receiving a Web page the library home page, the OPAC, the arrow, or like displayed on the Web site. In the following examples of *browsing,* users explicitly tell the

librarian that they can see a lot of numbers, the library's home page, or that they can see some other text displayed on the Web page. During *browsing* librarians are concerned essentially about whether users can see the Web page sent to them and/or whether users can see the content on the page.

- *I see alot of numbers and not sure which to use.*
- *i see the library's home page.*
- *i see it says it's sent, but nothing p oppped up.*

Educational Related includes the subcategories *guidance, demonstrations*, and *instruction*. *Guidance* entails librarians providing general information that points or directs users to specific resources or services (e.g., where to locate, who to contact, etc.). For example, librarians might provide general descriptive information about some resource, service, (e.g., *what* the resource or service entails and/or *where* it is located in the library system or elsewhere outside of the system). In the first set of quotes, librarians point users to other libraries and services on or to off campus resources:

- *Also, you might try the undergraduate counseling office of your School....*
- *so the record shows that this is available in the Main Library at the call number specified....it's on the 4th floor and you can check it out!*
- *You might also want to try the Reference Desk at the Science Library. They can be reached at [phone number].*

Librarians point users to specific resources on the library's Web site, for example to databases, the OPAC, etc.:

- *I would suggest that we start looking in LexisNexis*
- *I recommend looking in newspapers....*
- *You can look in OPAC, the Library's catalog, at: http://opac.lib.Univ.edu/*

Librarians point users to various shelving locations within the library, for example which floor has particular call numbers:

- *We have the issue on the 4th floor with the call number K 14 A858. YOu will need to look for volume 16 no. 38 page a19* .
- *write down this call number* .

Instruction is used to code when the librarian defines concepts or helps the user conceptualize things pertaining to the system, its resources and/or services. This is the *why* or

explanation pertaining to these. During *instruction*, the librarian does more than just point but sometimes defines concepts, makes value added judgments, or makes *if-then* statements concerning the system, its resources, and services. *Instruction* activities sometimes encompass a back and forth between users and librarians involving behaviors such as *browsing*, *asking questions,* and *confirming/acknowledging*. Below are quotes illustrating such coding of the data:

- *PDF will give you the article as it appears in the journal..sort of like a photocopy of the pages with charts and graphics.*
- *if you click on the [Univ] e-link and then select the [System Name] option it'll show you that it's only available at one library - [State abbreviation] state library].*
- *it's our best source for history articles... which is the great thing about this database [two lines combined].*

The code ***demonstration*** outlines a series of steps or directives given to assist the user on how to search, access a resource, complete ILL or renewal forms, etc. *Demonstrations* are generally visual types of activities involving *page pushing* via *co-browsing/escorting* features or activities involving *pasted*-in *URLs* without using *co-browsing/escorting* features. For example, transcript #664009, illustrates the librarian showing the user a particular database by outlining the steps involved in what s/he is doing. However, prior to pushing each Web page, the librarian tells the user that s/he would be clicking on objects such as the *Article Databases,* the letter *E* under *By Title*, *Expanded Academic ASAP,* the link to the University, respectively (lines 14-15, 17-18, 20-23). In many of these *educational related* activities, the user participates by making *confirming/acknowledging* responses (see lines 16, 19):

1. Transcript #664009
2. STATUS: Univ Undergraduate
3. User: How do I access ProQuest to find journal articles online? Sorry, I accidentally navigated away from this page.
4. [. . .]
5. Librarian: Is there a particular reason you want to search the Proquest databases? I'm not sure they will be relevant.
6. Librarian: I think that the database Expanded Academic ASAP will do the trick for you.
   2002-12-11 12:51:55 PT
7. **User: My friend said she found most of her articles on Proquest but maybe you can assist me to a better search engine**
8. **Librarian: I can show you. If you like.**
9. User: great thank you
10. **User: could you please show me?**

11. Librarian: OK, do you see the LIBRARY's web site on your browser?[]
12. User: yes
13. Librarian: OK, Don't until I tell you. Just follow along.
14. Librarian: I'm going to click on "Article Databases"
15. Librarian: [Page sent] http://www.lib.univ.edu/online/databases.html
16. User: ok
17. Librarian: Now, I will click on "E" under "By Title"
18. Librarian: [Page sent] http://www.lib.univ.edu/online/databases_e.html
19. User: ok
20. Librarian: and click on Expanded Academic ASAP
21. Librarian: [Page sent] http://www.cdlib.org/hlp/directory/eaasap.html
22. Librarian: and now [Univ name].
23. Librarian: [Page sent] http://web3.infotrac.galegroup.com/itw/[. . .]
24. Librarian: Are you follwoing me so far?
25. User: wow, very cool
26. [. . .]

The code *demonstration without co-browsing/escorting* involves librarians and/or users showing the other objects on the Web page but without the implementation of the *co-browsing/escorting* tools. Here, participants engage in collaborative viewing, searching of particular resources on the Web page, typically via *pasted-in URLs*. Transcript #931999 is an example of *demonstration without co-browsing/escorting*. In this transcript session, the librarian initially tries to *push page* to a database to show the user how to search for information on his or her topic (line 5); however, due to the user not being able to see the Web page (lines 8), the librarian alleviates this constraint by sending the user *pasted-in URLs* (lines 9, 11). Hence, the *demonstration* begins when the librarian sends the third *pasted-in URL* for the library home page (line 15). After sending the third *pasted-in URL,* the user is given a series of directives to select Articles Databases, scroll to Expanded Academic, select the University, to use advanced search respectively (lines 15, 17, 19-20):

1. Transcript #931999
2. STATUS: UNIV Undergraduate
3. User: i want to research information about age of consent for my writing 39C research. My topic is should juveniles be prosecuted as adults. Since some states can prosecute juveniles as young as 13 as adults i want to find information about age of consent. Legal age which is 18 that we are declared as independent
4. [. . .]
5. **Librarian: [Page sent] http://course.lib.univ.edu/hu/writing/w03/**
6. User: ok
7. Librarian: Let me know if you can see that....
8. **User: nope**

9. **Librarian: OK, the URL is: http://course.lib.univ.edu/hu/writing/w03/**
10. User: thanks
11. **Librarian: Also you can search in Opac (http://opac.lib.univ.edu/), our UNIV online catalog**
12. Librarian: try keyword searching on terms like "age of consent" and the other terms that you've given here...
13. Librarian: The other database you'll learn about in class is Expanded Academic...
14. User: ok thanks
15. **Librarian: to get to that: go to UNIV Libraries homepage (http://www.lib.univ.edu/) and select "Article Databases" at the top**
16. User: and then
17. **Librarian: then select "E" and scroll to Expanded Academic at the bottom of the list**
18. **User: uh huh**
19. **Librarian: ...select "[Univ name]" and then you're in..you can search there on keywords and subject headings**
20. **Librarian: use the advanced search feature for more options**
21. Librarian: you should be able to get started that way...how soon is your assignment due?
22. [. . .]

Scripted responses codes the standard messages sent by the librarian or computer, usually near the beginning and the end of digital reference sessions. Scripts from librarians include expressions at the beginning of transcripts such as "Welcome to Ask a Librarian LIVE! I'm reading your question...," (see lines 6 of transcripts # 137737and #1560372). Computer scripts, on the other hand incude messages such as "A librarian will be with you in about a minute**"** (lines 4 of these transcripts); "librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected" (lines 5, 9) ; and "[librarian - user has closed this session]," (transcript #137737, line 10 and transcript #1560372, line 14):

1. Transcript #137737
2. STATUS: UNIV Undergraduate
3. User: What do I do if I can't remember my pin?
4. **Computer response: A librarian will be with you in about a minute.**
5. **Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]**
6. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
7. Librarian: hi
8. [. . .]
9. **Computer response: [patron - has disconnected]**
10. **Note to staff: COMP-Hold [librarian - user has closed this session]**

1. Transcript #1560372
2. STATUS: Writing 39C Student
3. User: Can you recommend any journals/books where i can find information (causes, to be more specific) about medical malpractice?[]
4. **Computer response: A librarian will be with you in about a minute.**
5. **Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]**
6. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
7. Librarian: Where have you looked? Have you searched our catalog, [OPAC], yet?
8. [. . .]
9. User
10. thanks for the help so far
11. Librarian
12. You're welcome. Get back in if you need more help.
13. [. . .]
14. **Computer response: [librarian - user has closed this session]**

Abbreviations/emoticons codes symbols, icons, and abbreviations such as *LOL* (laughing out loud), *BTW* (by the way), *k* (ok), and so forth, which typically communicate emotions, attitudes, and other non-verbal expressions. Visual and audio non-verbal cues are used during face-to-face communication but are generally missing in Internet communication. To compensate for the lack of these paralinguistic cues, according to Herring (1999, 1996) and Werry (1996), online persons have devised and adopted linguistic strategies such as abbreviations/emoticons to expedite typing and limit ambiguities during digital interactions. Transcripts in this study show both user and librarian using abbreviations and emoticons such as:

- *k* for *ok*
- *o* for *oh*
- *u* for *you*
- *r* for *your* or *or*
- *alrt* for *alright*
- :-(for *sad face*)

Excerpts below provide examples of how these abbreviations and emoticons are used by digital information seekers (see transcripts #145556, line; and #1343999, line 8).

1. Transcript #145556
2. STATUS: Writing Student
3. User: how do i get the full text of this article http://Univ.247ref.org/wcscgi/CDM.exe?SS_COMMAND=CUST_SUP&Category=UNIV NAME

4. [. . .]
5. Librarian: hi [Person Name], just a minute while i look at this...
6. **User: k**

1. Transcript #1343999
2. STATUS: UNIV Graduate
3. User: Hello, I'm a medical student looking for an article on the effects of alcohol on anesthesia... I'm off campus and having a little trouble accessing articles. Can you please help?
4. [. . .]
5. Librarian: what about #2
6. Librarian: The patient recovering from alcohol or drug addiction: special issues for the anesthesiologist
7. User: i downloaded that one
8. **User: wasn't very good... :-(**

Asking questions is used to code strategies employed by users and librarians to clarify uncertainty during the digital reference interaction. When participants ask questions during the interaction, these generally are intended to help clarify or follow-up on written communication. The use of this code is illustrated in transcript #13068. The transcript shows the librarian saying that s/he will "walk [the user] through the process of locating an American History and Life article. . ." (line 9). Throughout the interaction, the librarian asks various questions, which generally help to clarify the *information need* (line 11, 14, 24, 26, 33). To determine whether s/he has fully answered the need and completed the reference transaction, the librarian also asks the user, "is there anything else I can help you with now?"(line 38), a *follow-up* question which is discussed further below for the *RUSA behaviors* code. In addition to the librarian asking questions, this transcript also shows the user *asking questions* beyond the initial *information need*, which also depicts uncertainty and a *need change* (lines 19, 30):

1. Transcript #13068
2. STATUS: UNIV Undergraduate
3. User: Humanities Core Student, Where do i locate the article I want to read from the America: History and Life search, (ABC-CLIO)?
4. Librarian: Hi. Sorry about the delay. I had another question.....
5. User: no problem
6. [. . .]
7. User: i can send the link
8. **User: http://serials.abc-clio.com/active/go/ABC-Clio-Serials**

9. **Librarian: You should now have the UNIV Libraries home page in front of you....I am going to walk you through the process of locating an American History and Life article.....**
10. [. . .]
11. **Librarian: Is your screen on the "A" page?**
12. User: yes
13. [. . .]
14. **Librarian: Put only one topic in the box. What are you looking for?**
15. User: [Item sent - Results (Short Entry)] http://serials.abc-clio.com/active/go/ABC-Clio-Serials
16. User: i am looking for mccarthyism and television
17. User: i found articles, i just can't get to them
18. [. . .]
19. **User: can i read the disertation?**
20. [. . .]
21. Librarian: Teh book that is being reviewed---See it Now is on reserve for your class...
22. [. . .]
23. User: i have what i need from the book, i just need articles
24. **Librarian: Have you tried the Expanded Academic article database or any other article database?**
25. [. . .]
26. **Librarian: What search terms were you using?**
27. User: mccarthyism, television
28. [. . .]
29. Librarian: We have the issue on the 4th floor with the call number K 14 A858. YOu will need to look for volume 16 no. 38 page a19
30. **User: so how can i receive it**
31. Librarian: [Item sent - Citations 1 to 12] http://web4.infotrac.galegroup.com/itw/infomark/354/616/3806 [. . .]
32. [. . .]
33. **Librarian: Do you think this one will help?**
34. [. . .]
35. User: it's a great article, i need some primary sources, however at the point i am just using what mccarthy himself states
36. [. . .]
37. User: ok
38. **Librarian: Is there anything else I can help you with now?**
39. User: i think that's all, thanks soooooo much!!!!
40. [. . .]

Other is used to code *digital collaborative strategies* that do not fit in any of the above *digital collaborative strategy* categories. Transcripts #227560 and #284395 are examples of this code. In transcript #227560, the librarian's statement seems to be leading into a reference interview on the following line:

1. Transcript #227560
2. STATUS: Writing 39C Student
3. User: I'm looking for a current academis source on food insecurity and unemployment in US and I can't find anything current enough. Where should I look?
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. **Librarian: I am trying to understand you topic a little more, so please help me**
8. Librarian: Is this for a science or social science approach?
9. [. . .]

Another leading statement is seen in transcript #284395. In this transcript the librarian's statement seems to lead into *guidance* and/or *instruction*:

1. Transcript #284395
2. STATUS: Univ Graduate
3. User: Where do I find the transpotation engineering books anf journals?
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [Univ Librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Hey, there!
7. User: hi
8. Librarian: Are looking for a particular title, or just the general topic?
9. User: denad analysis
10. User: demand analysis
11. Librarian: Ok, got it. Is that the title of a book or article?
12. User: are they in the main library
13. User: any book in that subject
14. Librarian: Ok, hold a sec while I check.
15. User: sure
16. **Librarian: OK. Here' s what I suggest you do...**
17. User: ok
18. Librarian: Go to the [name of the] Online catalog (http://opac.lib.univ.edu) and do a KEYWORD search on this exact phrase:
19. [. . .]

Concerning both these transcripts, there are no codes for such leading statements, and coding in this study is done line by line; thus, the previously discussed passages are coded with the *other* code.

PSYCHOLOGICAL

The *psychological* category pertains to affective and behavioral dimensions of users and librarians, and codes in this category include *Affective dimensions* and *RUSA behaviors*. Each of these subcategories incorporates its own subcategories as presented below.

RUSA behaviors codes the librarian's application of various courtesy behaviors appropriate for establishing rapport and smooth transactions with users in general during the chat digital reference process. Sub codes of this category include *approachability, interest, and follow-up*.[38]

The code *approachability* represents librarians showing warmth and friendliness toward information seekers during the digital reference interaction (RUSA 1996). When doing this, librarians initially greet information seekers with expressions such as *hello*, *hey there*, *howy*, *hi*, and the likes. In many sessions, librarians incorporate the following welcoming script: *Welcome to Ask a Librarian LIVE! I'm reading your question...* .

Interest codes passages pertaining to the attention and awareness that librarians show users during the digital reference interaction. Such awareness and attention are shown when librarians conduct the reference interview (RUSA 1996) and/or, according to Ronon (2003b), when librarians try to pace the interaction (*formality and pacing*). As seen in transcript #932037, the user wants documents on the removal of physical education requirements from public universities. The librarian shows an *interest* in the user's topic by *asking questions* that clarify the query in order to provide the appropriate answer. The librarian asks the user various questions throughout the reference interaction in (see lines 5, 7, 9, 11-12, 14, 17, 19-20). As previously discussed above, *asking questions* by the librarian during the digital reference interaction generally represents a reference interview.

1. Transcript #932037
2. STATUS: Writing 39C Student
3. User: I am trying to research information on physical education requirements for public universities. I was wonder where I could find documents that discussed the removal of the P.E. requirement?

[38] The RUSA behavior for *listening* was not coded. Because of the missing non-verbal and audio cues in the digital environment, listening seemed apparent only by showing that the librarian was paying attention. However, the librarian also had to pay attention to show *interest* toward or to *follow-up* with the user. Thus, coding *listening* would have resulted in too much overlap with these two other RUSA's behaviors.

4. [. . .]
5. **Librarian: Hi....have you had the library class yet or do you have it this week? Also have you done any searching yet at all?**
6. User: I took the class this morning and I've been attempting to find information for about and hour now
7. **Librarian: OK...can you tell me where you've been looking?**
8. [. . .]
9. **Librarian: have you searched in [opac] or Expanded Academic?**
10. [. . .]
11. **Librarian: ...also was this requirement removed for all public universities or just [state name]?**
12. **Librarian: ..and is it very recent?**
13. User: that i don't know, what i have to go on was that i know that there was a req. for the schools and now there's not... i dont think it was recently that's where i'm facing my dilemma i can't find any information that is older
14. **Librarian: hmm...are you focusing on [state name] tho?**
15. Librarian: [state name]t] http://web2.infotrac.galegroup.com/itw/[. . .]
16. User: well seeing that i can't even trace the info within ca, i dont think i would conceive of going larger scale
17. **Librarian: I just sent you an interesting looking article from Expanded Academic....can you see that in the web browser?**
18. [. . .]
19. **Librarian: where are you searching now? search parameters depend on how broad or narrow you want to be (like including [state name] or not, public universitiies, etc)...**
20. **Librarian: ...is your paper a pro and con analysis?**
21. [. . .]

According to Ronan (2003b), librarians also show *interest* during *Formality and pacing*, which entails the librarian emulating a user's behavior or entails the librarian not proceeding with the interaction until certain that the user is with him or her. For examples, the librarian:

- does not use emoticons until first used by the user;
- keeps users informed; and
- lets users know what s/he is doing during the digital reference process.

To insure that users are keep pace during the interaction, some librarians, particularly those engaging in *co-browsing/escorting* activities, ask users questions such as:

- *Are you following me?*
- *Are you up with me, I'll wait?*
- *Can you see my arrow?*
- *Can you hold ofr a sec?* [sic]

Some transcripts show librarians trying to pace the interaction by saying things like "I am clicking on 'Article Databases' See that?" The use of such pacing behaviors helps ensure that users are with librarians as they proceed with activities such as *searching*, *co-browsing/escorting, demonstration, instruction,* and the like.

It is typical for participants to make *confirming/acknowledging* utterances such as *ok, oh* during *formality and pacing*, including utterances such as *hmm, uhh*, and the like. Such utterances have previously been discussed above in the *confirming/acknowledging* section.

According to RUSA, *follow-up* is a behavior that librarians use to check whether users' questions have fully been answered or to encourage users to return to the digital reference service again. Librarians pose *follow-up* questions, such as:

- *. . .do you have any other questions?*
- *. . . please come back if you need further assistance later...*
- *Does this answer your question?*

Searching codes librarians searching or checking the OPAC, a database, search engine, and the like to find books, articles, or other items. This also includes discussions of search or retrieval results. The following quotes from transcripts are examples of librarians searching the OPAC, databases, and so forth:

- *We can each try doing the search separately and see if we can get through....*
- *Yes---I was just doing a search of Lexis nexis in another window.....*
- *that's not the best, but the final solution is to do a keyword search of the article text.*
- *If OPAC does not have your title you can search [System Name] Periodical catalog*

The code ***affective dimensions*** primarily represents feelings, attitudes, or emotions of users. Its subcategories include codes such as *gratitude; welcome, non-greeting; successes; support and encouragement; apologizes; readiness; likes; dislikes and failures*; and *other*.

Gratitude is a code capturing remarks of appreciation or gratefulness by users. In transcripts, users are seen offering polite or courteous remarks such as *thanks*, *thank you*, *welcome (non-greeting),* and similar utterance of appreciation. Users generally express *gratitude* when receiving information or answers from the librarian.

On the other hand, utterances such as *thanks* and *thank you* sometimes appear to have connotations other than appreciation during digital reference communications. That is, expressions of *gratitude* also appear to be used as a closing ritual, particularly when users are

leaving the chat digital reference session. Excerpts from transcripts below include examples of *thanks* used as a closing ritual rather than as a form of appreciation during the chat digital reference interaction (see below the category *termination* for examples of this code).

Another expression of gratitude is *welcome, non-greeting*, which is used as a response to thanks. Transcript #178424 (line 8) and #908729 (line 10) are examples of *welcome, non-greeting* used by librarians as a form of *gratitude.*

1. Transcript #178424
2. STATUS: Writing Student
3. User: How do I find information about the child nutrition bill H.R. 3873?
4. [. . .]
5. Librarian: Thanks for using the UNIV Libraries Ask a Librarian LIVE Service!
6. Librarian: The [Library Name] [] librarians have the Research Consultation Service
7. User: ok thanks
8. **Librarian: You are welcome :-)**
9. Computer response: [patron - has disconnected]

1. Transcript #908729
2. STATUS: UNIV Undergraduate
3. User
4. I am looking for a particular document. It is GWF. Hegel's The Philosphy of History. I tried checking online but have only found the versions to be in PDF format. This is a problem because my computer will not allow me to print the document because it is in PDF format. Plz help me!
5. [. . .]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: Hi. is this an article or a book?
8. [. . .]
9. User: thank you for your help
10. **Librarian**: **your welcome**
11. User: good bye
12. [. . .]

When *welcome* is a *greeting*, the *greeting* code is used. An example of this code is discussed as a subcategory of *initiation*.

Successes codes passages in which users make positive value statements concerning the answer received. In transcripts, statements concerning the worth or value of the answer received generally include expressions by users such as:

- *just what I needed*
- *#11 is perfec*

- *perfect*

Support and Encouragement codes expressions of encouragement, empathy, hopefulness, inspiration and the like. In transcripts, users and librarians make the following types of comments to support or encourage one another during the digital reference interaction:

- *(crossing fingers)*
- *Sure .. good luck!*
- *no problem*

Apologizes codes expressions of remorse by users and/or librarians. For example, participants in transcripts make apologetic statements such as:

- *Sorry we weren't able to get further!;*
- *Sorry, it will be a couple more minutes..;*
- *sorry for not making it clear; and*
- *Pls excuse my sloppyness [sic].*

Readiness codes two types of time factors concerning users and librarians: 1) *readiness to interact*; and 2) *immediacy of answer*. *Readiness to interact* is the willingness of a participant to interact on tasks such *searching*, *co-browsing/escorting*, and working on the need in general. *Readiness to interact* also tends to serve as a means of pacing the interaction as seen in quotes below:

- *Are you ready?*
- *hold on a second let me type them for you*
- *OK ... I'll be back in a minute...*
- *I'm ready, lead on*
- *ok i'm back*

Immediacy of need codes the urgency with which users express their desire to receive answers to their *information need* quickly. This code is depicted in transcripts with expressions from users such as, "how long will it take until i get the article" [sic]; and "i can't wait for it [the information] because i have an essay due" [sic].

Other codes emotions and attitudes not included in any of the above affective dimensions. This category includes codes such as *corrects self, relief, repetition, repeat user, expectations*, and *can't determine*.

Corrects self codes responses users and librarians make to *self-correct* themselves following a mistake. In transcripts, participants sometimes make corrective statements such as "ooops! protection, i meant" [sic]. Transcript #1343999 is another example of the librarian *self-correcting* herself or himself after mistakenly saying, "So we do own this journals at all" (line 5), wherein s/he later corrects this by saying, "do not" (line 8).

1. Transcript #1343999
2. STATUS: UNIV Graduate
3. User: Hello, I'm a medical student looking for an article on the effects of alcohol on anesthesia... I'm off campus and having a little trouble accessing articles. Can you please help?
4. [. .]
5. **Librarian: however, there is none. So we do own this journal at all.**
6. User: or a "online link"
7. User: ?
8. **Librarian: do NOT...**

Repetition codes users and librarians repeating their own comments or repeating comments of the other during the chat digital reference interaction. Transcript #220159 below shows the user repeating his or her prior comments (lines 3, 8). Such user behavior is also seen in transcript #81171 (lines 3, 10). However, this transcript also shows repetition by the librarian (lines 6-7). Transcript #1414654, on the other hand, shows both user and librarian repeating one another's comments (lines 8, 11, 14, 16).

1. Transcript #220159
2. STATUS: Univ Undergraduate
3. **User: i was trying to log onto Expanded Academic ASAP and it ask me to enter my library id or other id. I tryed to use my student Id but that did not work, I was wondering what ID i should use inorder to log in?**
4. [. . .]
5. User: [Page sent - OPAC NAME Web/Univ Libraries Public Access Catalog] http://OPAC Name.lib.univ.edu/
6. User: [Page sent - Aleph main menu] http://systemname.cdlib.org/
7. User: [Page sent - System Name - Basic Search] http://systemname.cdlib.org:80/F/?func=file&file_name=find-b&local_base=cdl90
8. **User: i was trying to log onto Expanded Academic ASAP and it asked me to enter my library id or other id. I tryed to use my student Id but that did not work, I was wondering what ID i should use in order to log in?**
9. Librarian

1. Transcript #81171
2. STATUS: UNIV Graduate
3. **User: Hi, I would like to access online version of new england journal o f medicine from home. I am currently connected to UNIV through VPN client.**
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
7. **Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...**
8. Librarian: How can I help you today?
9. Librarian: Dear
10. **User: Hi, I would like to access online version of new england journal of medicine from home. I am currently connected to UNIV through VPN client.**
11. Librarian: Pls excuse my sloppyness
12. [. . .]

1. Transcript #1414654
2. STATUS: Writing 39C Student
3. User: To whom it may concern: I am looking for this article. Is this article available for print at the UNIV main library? The New York Times, Feb 23, 2003 p28(N) p32(L) col 1 (35 col in) 3 look to college suit to show their merits; plaintiffs hope to prove they belonged
4. [. . .]
5. Librarian: from our homepage click on "Opac" catalog(top left in box)
6. User: ok
7. Librarian: at search menu click "Selet Collection" and limit to "Journals and Serials"
8. **Librarian: then search Title: New York Times**
9. User: ok
10. [. . .]
11. **User: new york times**
12. User: 1st entry is new york times with 4 MAIN LIBRARY in bold
13. [. . .]
14. **User: 3 look to college suit to show their merits; plaintiffs hope to prove they belonged:: i put this in step 3**
15. Librarian: just use the first part of that title:
16. **Librarian: 3 look to college suit to show their merits**
17. [. . .]

Repeat user codes texts indicating users who have previously accessed the digital reference service. Examples of this code are seen below in transcripts #145594 (lines 7, 9) and #172393 (lines 3, 12, 14), which indicate a return visit to the service by these users.

1. Transcript #145594
2. STATUS: Writing 39C Student

3. User: I'm using lexisnexis statistical database to search for statistics on dental coverage and low wage employers but i can't seem to find any. What should I type in the keyword box?
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. **Librarian: hi again**
8. User: hehe, hi
9. **User: looks like i did need help again**
10. Librarian: let me look at this...
11. [. . .]

1. Transcript #172393
2. STATUS: UNIV Undergraduate
3. **User: The second I disconnect from this, I lose the ability to access the journal article I was viewing!**
4. [. . .]
5. Librarian: I'm sorry, do you know how to find it again?
6. User: yeah
7. User: [Item sent - University Name /All Locations] http://opac.lib.univ.edu/search/t?SEARCH=Infant+Mental+Health
8. User: [Item sent - Wiley InterScience: Journal Issues - Infant Mental Health Journal] http://www3.interscience.wiley.com/cgi-bin/jtoc/33748
9. User: do i have to be connected to have access to it?>
10. User: [Item sent - Wiley InterScience: Journal Issues - Infant Mental Health Journal] http://www3.interscience.wiley.com/cgi-bin/jtoc/33748/2002
11. User: [Item sent - Wiley InterScience :: Journal Issue -] http://www3.interscience.wiley.com/cgi-bin/jissue/90511202
12. **Librarian: were you unable to access it after we disconnected?**
13. User: [Item sent - UNTITLED_PAGE] http://www3.interscience.wiley.com/blank.html
14. **User: as soon as i disconnected the page disappeared and it was blank**
15. [. . .]

Expectations codes user anticipation regarding the digital reference interaction, services, resources and the like. The following excerpts from transcripts illustrate how this code is applied:

- *yes this was more in the direction i wanted to head*
- *I am sure I'll find a lot more articles from these two databases!*
- *when u said there was a link i thought maybe i coould install the software here on ym*
- *computer.*
- *I assume they are all in the same area*

Dislikes and Failures codes unfavorable comments by the user and/or the librarian during the digital reference interaction; it also codes negative value judgments pertaining to search results. Quotes from users and librarians below represent their expressions of dislikes and failures regarding searches, the OPAC, and subject matter:

- *wow, ok I only got 17, must have* [d]*one the search wrong,*
- *not the right subject*
- *That is the problem with [the OPAC], I didn't like it but nothing I can do about it.*

Can't determine codes passages in which emotions and attitudes do not fit into any of the other *affective dimensions* categories. An example of this code is seen in transcript #1229715. Following the librarian's questions pertaining to limiting the search to specific dates and getting too many (lines 7-9), the user responds with "heheh." It is uncertain whether "heheh" is said as a sheepish laugh, as *oh yes*, or what. Therefore, the passage is coded as *can't determine*.

1. Transcript #1229715
2. STATUS: UNIV Undergraduate
3. User: hi, i'm looking for articles on alzheimers for my extra credit paper. I don't know where to start.
4. [. . .]
5. User: yea, alzheimers right?
6. User: oh i seeeee now
7. **Librarian: did you limit your search to any specific dates or anything else?**
8. **Librarian: too many, right**?
9. **User: heheh**
10. User: thank you soo much!
11. [. . .]

Transcript #21451 is another example of the *can't determine* subcategory of the *other* subcategory. The user responds, "phew," presumably as a sigh of relief following the librarian asking whether the computer screen has changed (line 5, 8). The user appears to be uncertain about what has been going on and believes that s/he has done something wrong (lines 7).

1. Transcript #21451
2. STATUS: UNIV Undergraduate
3. User: How can I find a thesis on abortion or capital punishment? It doesn't have to be from a Univ student.
4. [. . .]
5. **Librarian: Did the screen on your computer change to [the Opac name]?**
6. User: yes
7. **User: i thought it was something i did**
8. **User: phew**

9. Librarian: OK--let's do a search. Do you want capital punishment or abortion first?
10. User: abortion please
11. [. . .]

Barriers

Wilson (1981) points out that sometimes *barriers* arise out of information needs. Such impediments include things that delay or prevent users from achieving their information seeking goals. Constraints occurring during chat digital reference interactions include *forgetfulness, mistakes; technological related*; *searching*; *access/availability*; and *can't determine*.

Forgetfulness, mistakes codes passages pertaining to forgetfulness, mistakes, confusion, uncertainty, and the like. The quotes below from transcripts represent examples of how this code is applied:

- *I forgot to write the date of the aticle*
- *I see alot of numbers and not sure which to use.*
- *complications is spelled wrong*
- *there is a search engine for locating journal articles but i don't remember the address*

Technology related codes difficulties pertaining to *disconnections, access, availability, navigation, links, software, the computer in general, logon,* and related types of *barriers*.

Navigation and viewing codes problems pertaining to receiving and viewing Web pages and opening links. Below are examples of quotes from transcripts showing how this code is applied:

- *I see the [Univ name] e-links page you opened but not the [system name] page.*
- *there is no display when i click on it, its just a blank page .*
- *Is it not working? My screen is not changing ... .*

Sessions with *disconnection technological barriers* sometimes indicate the librarian's unawareness of the user disconnection from and reconnection to the digital reference service. Transcript #1374252 below is an example of a user *disconnection* from the service. When the user reconnects to the session, the librarian proceeds with the interaction as though there has been no interruption in the session (lines 3-7. . .). The disruption in the service may have gone unnoticed by the librarian except for seeing the user's reconnection to the service again.

22. Transcript #1374252
23. STATUS: UNIV Undergraduate

24. **User: I was disconnected.**
    2003-04- 8 17:46:37 PT
    [. . .]
25. **Librarian: OK**
    2003-04- 8 17:47:18 PT
26. **Librarian: Anyway if this is the book:[]**
    2003-04- 8 17:47:21 PT
27. **Librarian: Top-Down Network Design by Priscilla Oppenheimer**
    2003-04- 8 17:47:43 PT
28. **Librarian: UNIV does not have a copy and I can't find a copy in the UNIV system...**
    2003-04- 8 17:48:03 PT
29. Librarian: You could borrow it from somewhere else but it might take several weeks
    2003-04- 8 17:48:16 PT
30. **[. . .]**

Constraints involving *software and computer* include problems with computer hardware, Web browsers, and related *barriers* as outlined below in quotes from transcripts:

- *sorry, the E key on this lab computer sometimes doesnt work .*
- *I was using netscape and that never seems to work with this.*
- *sorry, "co-browsing not supported" on my computer .*

Librarians in chat digital reference sessions point out *software and computer* related constraints pertaining to the proxy server, *co-browsing/escorting*, and related *barriers*. The following quotes represent examples of some *barriers* librarians have identified during the digital reference session:

- *hmm. . . somehow, your proxy is not configured correctly .*
- *unfortunately, the escort feature is not going to work .*
- *If you are at a company you will have problems with the firewalls. .*

Time factor, *printing*, and *other* comprise a small number of *technological related barriers*. In many of these sessions, such *barriers* occur while participants are conducting searches. Sessions with *searching* related *barriers* generally show users having difficulties finding information that matches their *information need.* See the quotes below for examples of this type of barrier:

- *I tried this afternoon to find books but cannot find any really directly related to what i want*
- *But I have access to databases to search and have not found current journal addressing the basics of these theories.*

- *because i tried searching through Opac with keywords but they didn't have any books with the keywords that i entered*

As seen in transcript #150724 below, librarians sometimes point out searching related *barriers*. The user in the transcript is having difficulty finding full articles from the *Journal of the Electrochemical Society* (line 3). However, the user is also having difficulty going back to the previous search screen in the OPAC and is leaving out a word in the journal title during his or her search (lines 13, 17). To alleviate this constraint, the librarian proposes taking control of the user's browser, tells the user to "click on journal/title," and pushes the Web page for the OPAC (lines 10, 25). This allows the librarian to escort the user to the desired place to type in the title of the journal (lines 12, 14). Afterwards the librarian questions the accuracy of what the user types and eventually points out that the user left out the article "the" in the journal title (lines 18, 21, 23). This omission by the user is seen in the URL following the word *SEARCH* (line 17):

1. Transcript #150724
2. STATUS: UNIV Graduate
3. **User: I am lookind for articles on two journals, there are "Electrochemical and solid-state letters" and Journal of the Electrochemical Society. The search result by [System name] shown me that there have electronic files available in UNIV, but I checked full-text journals search can not find them... what is the problems?**
   2004-02- 4 16:54:52 PT
4. [ ]
5. Librarian: now click on title
   2004-02- 4 16:56:41 PT
6. User: [Item sent - Author/Title Search] http://OPAC Name.lib.Univ.edu/search/q
   2004-02- 4 16:57:04 PT
7. Librarian: no, just a title search
   2004-02- 4 16:57:14 PT
8. Librarian: go back
   2004-02- 4 16:57:28 PT
9. User: [Item sent - http://OPAC Name.lib.Univ.edu/search/q]
   http://OPAC Name.lib.Univ.edu/search/q
   2004-02- 4 16:57:40 PT
10. **Librarian: hold on, let me take over**
    2004-02- 4 16:57:58 PT
11. Librarian: okay, from here, click on title/journal title
    2004-02- 4 16:58:03 PT
12. **Librarian: [Item sent - OPAC NAME Web/Univ Libraries Public Access Catalog]**
    http://OPAC Name.lib.Univ.edu/
    2004-02- 4 16:58:05 PT

13. User: I can not go back
2004-02- 4 16:58:16 PT
14. Librarian: [Item sent - OPAC NAME Web/Univ Libraries Public Access Catalog]
http://OPAC Name.lib.Univ.edu/
2004-02- 4 16:58:27 PT
15. User: [Item sent - Title Search] http://OPAC Name.lib.Univ.edu/search/t
2004-02- 4 16:58:39 PT
16. Librarian: okay, put in the title of the journal
2004-02- 4 16:58:45 PT
17. **User: [Item sent - University /All Locations] http://OPAC Name.lib.Univ.edu/search/t?SEARCH=Journal+of+electrochemical+society**
2004-02- 4 16:59:10 PT
18. Librarian: is that the exact name of the journal?
2004-02- 4 16:59:20 PT
19. User: [Item sent - University /All Locations] http://OPAC Name.lib.Univ.edu/search/a?a
2004-02- 4 16:59:50 PT
20. User: Journal of the Electrochemical Society
2004-02- 4 16:59:54 PT
21. Librarian: did you mistype the journal title?
2004-02- 4 17:00:06 PT
22. User: no
2004-02- 4 17:00:25 PT
23. Librarian: okay, you left out "the" in the first search
2004-02- 4 17:00:25 PT
24. User: [Item sent - Keyword Search] http://OPAC Name.lib.Univ.edu/search/a?a
2004-02- 4 17:00:38 PT
25. Librarian: let me take over[]
2004-02- 4 17:00:43 PT
26. [. . .]

The code ***searching*** pertains to *barriers* occurring during the actual search process. Such *barriers* are classed as *searching* and are depicted in the following excerpts from transcripts:

- *. . . I was having trouble just searching for dissertations.*
- *yeah i couldn't find anything on [the opac] but i hink that might be because i'm just not hitting on the right key words to search for* [sic].
- *. . . that's where i'm facing my dilemma i can't find any information that is older* [sic].

Finally, ***access/availability*** codes texts pertaining to participants experiencing two types of *access/availability* problems: 1) those related to login or related to specific Web page or database *access*; and 2) those related to the *availability* of documents once found. Quotes below indicate that users sometimes experience difficulty with logging on and trying to *access* the

digital reference service itself, or that they experience difficulty trying to access specific Web pages, databases, and the like:

- *Yes, but I cant seem to access the logon page. Is this material available electronicall yet?*
- *still can't access infortrac*
- *when i click on the user agreement, i get taken to a page that says "access forbidden"*

In addition to *access/availability* related *barriers*, sometimes resources can not be accessed or are unavailable for meeting the *information need*. This type of *barrier* is seen in the following quotes from transcripts.

- *UNIV does not have a copy and I can't find a copy in the UNIV system.. UNIV does not have a copy and I can't find a copy in the UNIV system..*
- *This title Psychiatric annals is not available electronically*
- *but you are right that for now it doesn't seem to be available online and we don't have a print subscription...When I open the PDF, the save or save as buttons are unavailable.*
- *Hmmm, seems to be an overload on the system. Maybe too many simultaneous users.*

Can't determine is a *barrier* that does not fit in any of the above categories. See below examples of quotes from transcripts representing this code:

- *....ok, just spoke w/someone and he said they are not sure what the problem is but....*
- *I've had some hard time coming up with actual research.*
- *ya, i keep getting weird messages*

ah i don't like my topic i think that is the problem

Termination

Termination codes how the chat digital reference session ends. It includes four subcategories of closings for the session: *normal closings, evaporation, abnormal closing*, and *can't determine*.

Normal closings codes text indicating that the chat digital reference session has ended with participants following a normal closing ritual. Normal closings typically find the user and/or librarian saying things such as *bye, goodbye,* and so forth. Moreover, *normal closings* generally

include computer scripts at or near the end of transcripts with the message, "user has closed session." Transcript #1343999 is an example of a *normal closing*, note both the user and librarian end the session by saying "bye" (lines 9, 11). This is followed by two computer scripts saying "user - has disconnected" [sic] (lines 13-14) and "librarian – user has closed this session" (line 16). That is, like opening *scripted responses* appearing prior to user-librarian interactions at the beginning of the chat session, there are closing *scripted responses* appearing after user-librarian interactions at the closing of the session.

1. Transcript #1343999
2. STATUS: UNIV Graduate
3. User: Hello, I'm a medical student looking for an article on the effects of alcohol on anesthesia... I'm off campus and having a little trouble accessing articles. Can you please help?
4. [. . .]
5. User: Thank you...
6. Librarian: OK. I should go though.
7. Librarian: OK
8. Librarian: ur welcome.
9. **User: bye**
10. Librarian: this is the real world of searching ;-)
11. **Librarian: bye**
12. User: :-)
13. **Computer response: [User - has disconnected]**
14. **Computer response: [User - has disconnected]**
15. Librarian: note to staff: COMP-Ref
16. **Computer response: [librarian - user has closed this session]**

Furthermore, digital reference session closings tend to be somewhat user-driven, while session openings appear librarian driven. For example, some *normal closings* end with no closing remark by the user, but with user statements such as *thanks, thank you,* and similar expressions appearing near or at the end of the transcripts. As previously discussed under *gratitude* these utterances sometime are indicative of session closings, and sometimes appear as a closing ritual.[39] Transcript #1222711 (lines 3-4, 7) provides examples of this type of closing ritual.

1. Transcript #1222711
2. STATUS: Writing 39C Student

[39] Typically thanks and thank you are considered as expressions of appreciation and courtesy. Mon and Janes (2003) investigate the use of such expressions as indicators of user satisfaction in digital reference.

3. User: where could I find empirical articles from journals in the library that report actual data collected from research?
4. [. . .]
5. **User: No I think that was it. Thanks**
6. **User: Have a great day.**
7. Librarian: You're welcome!
8. Librarian: You too!!
9. **User: Thanks after this I will. Yay!**
10. Computer response: [user - has disconnected]
11. Librarian: note to staff: COMP-Ref
12. Computer response: [librarian - user has closed this session]

Evaporation is when users do not respond and when they leave the online interaction without giving any closing prompts. Janes (2003) and Kresh (2002/2003) refer to this as the phenomenon of the disappearing user. In some instances, the user's departure occurs during the middle of the transaction, which tends to leave librarians wondering about the user's online status or wondering about the status of the interaction itself. Transcript #933247 is an example of a session where the librarian is uncertain about the user's online status, because the user has disconnected without going through the typical closing ritual (lines 7-9). Upon realizing that the user has disconnected, the librarian notes at the end of the session that this is a "lost ref" (line 7):

1. Transcript #933247
2. STATUS: Writing Student
3. [. . .]
4. User: [Page sent] http://opac.lib.univ.edu/search/X
5. Computer response: [patron - has disconnected]
6. User: ?
7. **Librarian: Are you still there?**
8. **Computer response: [patron - has disconnected]**
9. **Librarian: note to staff: LOST-Ref**
10. Computer response: [librarian - user has closed this session]

Abnormal closing codes abrupt disruptions in the chat digital reference service, which cause participant(s) to disconnect from the session, also without prior notice to the librarian. Such service disruptions tend to be *technologically related*, resulting in the *termination* of either or both user or librarian from the session and sometimes with their reconnecting to the service. Such *terminations* might also be considered as a *barrier* to the digital reference transaction. Transcript # 144040 is an example of an *abnormal closing*. Here, the session appears to end abruptly while the user is searching (lines 13-16). As such, this and similar constraints to the information seeking process impede both user and librarian from accomplishing their respective

goals, that is, the user obtaining an answer and the librarian providing that answer. *Abnormal closings* differs from *evaporation* in that the librarian generally knows when the user initially disconnects from the session, while *evaporation* the librarian does not know when the user initially disconnects from the session.

1. Transcript #144040
2. STATUS: UCI Graduate
3. User: I am looking for the following book: Wind turbine operation in electric power systems : advanced modeling / Z. Lubosny The [OPAC Name] catalog says 1 copy was ordered in Dec. Is this book available now?
4. Computer response: A librarian will be with you in about a minute.
5. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
6. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
7. Librarian: If the book has not been received and the status is not "in process" it is not available.
8. Librarian: I will check [the OPAC].
9. User: Thank you. Where else might I look for this book?
10. Librarian: If you search for this title on [the OPAC] it is located at [University name] and [City name] and you can request through interlibrary loan from these campuses
11. Librarian: Do you know how search [the OPAC] from the library's homepage?
12. User: yes. I'll check that out. Thank you.
13. **User: [Item sent - [OPAC] - Basic Search]**
14. **http://opac.cdlib.org:80/F/?func=file&file_name=find[. . .]**
15. **User: [Item sent - OPAC- Search Results] http://melvyl.cdlib.org[. . .]**
16. **Computer response: [patron - has disconnected]**
17. Librarian: Note to staff: COMP-Hold [librarian - user has closed this session]

The code ***can't determine*** tags *terminations* or disconnections from the system by users and/or librarians that cannot be clearly assigned to any of the other termination categories.

Need Resolution

Resolution codes texts indicating whether the user receives an answer to his or her *information need* prior to leaving the digital reference session. This category includes four subcategories: *resolved, referral, unresolved*, and *can't determine*.

The code ***resolved*** indicates that the user receives an answer to his or her *information need* prior to *termination* of the digital reference session. This entails answers provided by the librarian or by the user himself or herself. An example of a resolved need is seen below in transcript #520916 in which the initial user need is described in line 3 and answered by the

librarian in lines 18-19. The user extends the request by asking an additional question (line 24), which is resolved by the librarian in line 25.

1. Transcript #520916
2. STATUS: Univ Undergraduate
3. **User: I have tried to access the article database and it says I need a username and password. im not sure what username and password they are talking about, please help**
4. [. . .]
5. Librarian: hi, have you tried to configure your browser through the proxy server?
6. User: i dont know how to do that
7. User: i went to the instructions and the page didnt work
8. Librarian: i'll show you
9. Librarian: [Page sent] http://www.lib.univ.edu/
10. Librarian: do you see the library's homepage?
11. User: ya
12. User: go to connect from home right?
13. Librarian: yes
14. User: but this text box wont cancel if i go there will it?
15. Librarian: no, it won't
16. User: [Page sent] http://www.lib.univ.edu/services/how/connect.html
17. [. . .]
18. **Librarian: okay, here are the instructions. go ahead and follow them closely**
19. **Librarian: once you set up the proxy, then use your [Univ] net ID and password to access databases**
20. Librarian: If you still have problems accessing databases, please call the NACS helpdesk (Network and Academic Computing Services) at [Phone number].
21. Librarian: Does this answer your question?
22. User: wait
23. Librarian: okay
24. **User: what is my password?**
25. **Librarian: your email password**
26. User: is it a small code? or is it the barcode on my ID?
27. User: ohh ok
28. User: thank you very much
29. [. . .]

Referral codes text in which librarians' refer users to other services and resources within or outside of the digital reference service to answer the *information need*, including services and resources such as ILL, other people, agencies, and the like. Transcript #1028426 depicts a user having difficulty locating journal titles for 1985 to obtain articles on child homicide (lines 3, 11). Because the journal of interest is not in the library, the librarian refers the user to another library having the title (line 13) and to ILL services to request a copy of the title (line 15):

1. Transcript #1028426
2. STATUS: UNIV Undergraduate
3. **User: I'm trying to obtain articles on child homicide. Right now I have a few articles and am trying to find more based on the references cited, but I'm having trouble locating some of the journals (i.e. Journal of Forensic Science). So, where is the best place to search?**
4. [. . .]
5. User: ok, so if I look for other journals and don't get a hit, then its not available here, right?
6. Librarian: OK then you can get your article in the SL Do you have another journal title?
7. Librarian: If so type it int the the title search near the top of the screen.
8. User: [Page sent] http://Opac.lib.Univ.edu/search/a?a
9. Librarian: OK we have this title in paper and on the web if you want an article in 2001-
10. Librarian: Does this make more sense to you?
11. **User: yes, but I need it from 1985**
12. Librarian: Look at the third box.
13. **Librarian: it is located the [Library Name]**
14. User: ok, that is the library in Orange, right?
15. **Librarian: you can request a copy through ILL or the loan desk**
16. User: how do I do that?
17. Librarian: [Page sent] http://Opac.lib.Univ.edu/search/
18. Librarian: see where it says Interlibrary Loan/DDS
19. Librarian: [Page sent] http://Opac.lib.Univ.edu/screens/ill.html
20. Librarian: [Page sent] http://Opac.lib.Univ.edu/illj
21. User: oh, ok
22. [. . .]

The code ***unresolved*** indicates that an answer to the *information need* is not provided, nor is the user referred to another resource or service prior to completing the transaction. Transcript #80717 below is an example of this code, where it is seen that the user is still trying to find information on spying in the workplace (lines 13-14). Indicating that the user has been disconnected, apparently while in the midst of searching (lines 16-18), the librarian indicates that this need has not been resolved. The librarian also notes that this is a lost reference in line 19:

1. Transcript #80717
2. STATUS: Writing 39C Student
3. **User: i'm trying to find search results on workplace surveillance but more specifically, on customer surveillance on employees, i looked in a lot of the databases and couldn't really find anything, ny suggestions??????????? please help!!!!!!!1**
4. [. . .]

5. User: [Item sent - Article Databases (Univ Libraries)] http://www.lib.Univ.edu/online/databases.html
6. [. . .]
7. Librarian: You can get the link by going to "Article databases" on our web page...
8. User: [Item sent - Advanced Search] http://proquest.umi.com/pqdweb?AT=any&AT=any&afterDa [. . .]
9. User: [Item sent - Results] http://proquest.umi.com/pqdweb?AT=any&afterDate=mm/dd/yy [. . .]
10. Librarian: I see it seems to be sending you the webpages where I did the search. Not sure. Anyway, you could watching try the search and see if some of the articles are appropriate..I see some on companies employees email, etc...
11. User: yea thats what i have been fining, employers surveillance on computer, but it would be much better if i would be able to find something where the customers spy on employees
12. [. . .]
13. **User: what i am hoping for is thati dont think i can find research that detailed so im thinking to just look for how employers spy on their employees**
14. **Librarian: Yeah, well I suggest playing around in the ABI Inform database. "surveillance" is a subject term they use. you could combine with "camera" and terms like "housekeeper" "maid" etc. to see if you can get something. These words may be too specific, so also try "employee" "worker"...**
15. User: find research inwhich i might be able to fin facts and statistics on how surveillance improves quality or productivity or decreases drug usage or something similar
16. **User: [Item sent - Advanced Search] http://proquest.umi.com/pqdweb?AT=any&afterDate=mm/dd/yy [. . .]**
17. **User: [Item sent - Advanced Search] http://proquest.umi.com/pqdweb?AT=any&afterDate=mm/dd/yy [. . .]**
18. **Librarian: sorry, I think we got disconnected. So you will get this transcript in your email. Hope this helps. Call again if you would like more assistance..Bye**
19. **Note to staff: LOST-Ref [librarian - user has closed this session]**

Can't determine indicates that the researcher is unable to determine whether the need has been resolved or not. In transcript #933247, the user is researching whether college athletes should be paid (line 3). Although the user is seen searching or clicking on the Web page sent by the librarian for the OPAC (line 12, 14, 18-18, 24-31), s/he appears to have undergone a disconnection from and reconnection to the service during the session (lines 31-33). This appears to leave both the user and the librarian uncertain as to the status of the interaction (lines 33-34, 36). While it is possible that the user has not obtained what s/he needs, it is also possible that the user has obtained what s/he needs prior to the disconnection from the service (line 35). Hence, due to ambiguities as to the resolution of this *information need*, this is coded as *can't determine.*

Transcript #933247
STATUS: Writing Student

1. **User: If I want to research whether or not college athletes should get paid, where should I look for information?**
2. Computer response: A librarian will be with you in about a minute.
3. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
4. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
5. Librarian: You can look for articles or books. Do you prefer one or the other?
6. Librarian: to start that is...
7. User: books first
8. Librarian: Okay, we look for books in [the OPAC}...
9. Librarian: let me send that page to you...
10. **Librarian: [Page sent - OPAC] http://Opac.lib.uNiV.edu**
11. User: okay
12. **Librarian: Did you see the [OPAC] page I sent?**
13. User: Yes I see it.
14. Librarian: I would begin by searching for subjects like:
15. Librarian: school sports
16. **User: [Page sent] http://Opac.lib.uni.edu/search/d**
17. **User: [Page sent] http://opac.lib.univ.edu**
18. **User: [Page sent] http://opac.lib.univ.edu/search/d**
19. Librarian: I'm not sure those books are very helpful...let me look around while you do the same...
20. User: okay
21. Librarian: let me know if you find anything you like.
22. **User: [Page sent] http://opac.lib.univ.edu/search/dschool+sports/dschool+spor [. . .]**
23. **User: [Page sent] http://opac.lib.univ.edu/search/**
24. **User: [Page sent] http://opac.lib.univ.edu/search/X**
25. **User: [Page sent] http://opac.lib.univ.edu/search/X**
26. **User: [Page sent] http://opac.lib.univ.edu/search/Xschool+sports&searchsc [. . .]**
27. **User: [Page sent] http://opac.lib.univ.edu/search/**
28. **User: [Page sent] http://opac.lib.univ.edu/search/X**
29. **User: [Page sent] http://opac.lib.univ.edu/search/X**
30. **Computer response: [patron - has disconnected]**
31. **User: ?**
32. **Librarian: Are you still there?**
33. **Computer response: patron - has disconnected]**
34. **Librarian: Hello?**
35. Librarian: note to staff: LOST-Ref
36. Computer response: [librarian - user has closed this session]

Logistics

Although the language employed by users and librarians in chat reference transcripts helps to understand users' experiences during their collaborative digital reference encounters. This includes contextual information such as time of the interaction and status of the user in the interaction. The logistics category comprises the subcategories *begin time* and *end time.* *Begin time* and *end time* are used to derive the length of the digital reference session or session length.

Begin Time codes texts representing the time users initially connect to the chat digital reference service. This is generally the same time associated with the user's *information need*.

The code ***end time*** represents the time of the user's disconnection from the service. However, in some instances librarians disconnect from the service before the user. When this occurs, the librarian's disconnect time is coded as the *end time* because s/he is first to end the interaction.

Begin and *end* times are coded for each transcript, and the difference between these two times yields the session length, which represents the length of time for the entire digital reference session. That is, begin time generally represents the time of the initial submission of the user need to the service. Generally the user is the first person to disconnect from the service. Thus, a session length is the difference between the *begin time* and *end time*. Transcript #21451 below provides an example of the *begin time* (line 4) and the *end time* (line 26).

1. Transcript #21451
2. STATUS: UNIV Undergraduate
3. User: How can I find a thesis on abortion or capital punishment? It doesn't have to be from a Univ student.
4. 2003-06-25 **12:15:09 PT**
5. Computer response: A librarian will be with you in about a minute.
6. 2003-06-25 12:15:26 PT
7. Computer response: [librarian - will be with you momentarily. Please do not hit your refresh or back button or you will be disconnected.]
8. 2003-06-25 12:15:51 PT
9. Librarian: Welcome to Ask a Librarian LIVE! I'm reading your question...
10. 2003-06-25 12:16:25 PT
11. Librarian: Hi
12. 2003-06-25 12:16:43 PT
13. User: hello
14. 2003-06-25 12:17:03 PT
15. 2003-06-25 12:21:19 PT
16. [. . .]

17. User: okay
18. 2003-06-25 12:45:41 PT
19. User: thank you
20. 2003-06-25 12:46:12 PT
21. Librarian: You're welcome. Sorry I wasn't able to replicate the same search but there are lots of different sources.
22. 2003-06-25 12:46:28 PT
23. User: it's okay
24. 2003-06-25 12:46:32 PT
25. Computer response: [patron - has disconnected]
26. 2003-06-25 **12:47:28 PT**

Other contextual information appearing in transcripts includes the *date* of the chat reference interaction and the *status* of the user (student) interacting with the service. Because these descriptors appear in all transcripts and only vary in specific ways relevant to any one transcript, these descriptors are treated as attributes in the Nvivo coding software rather than as codes. That is, attributes are incorporated into a drop-down menu and selected during coding of a transcript, rather than by highlighting text and linking it to a code. Also, the *date* is a common attribute in each transcript e.g., containing the year values of *2002, 2003*, or *2004*. The *date* and *times* stamps are distributed throughout, as transcript #21451 (lines 3-22) above shows.

Unlike the values for the time and year, values for the attribute *student* include *undergraduate, graduate, writing student, and medical resident*. These values are found in the status section of transcripts and are also incorporated in and selected from a drop-down menu in Nvivo.

APPENDIX E: PARTICIPANT RECRUITMENT

1. **First Announcement**
2. **Second Announcement**
3. **Pre-screening Questionnaire**
4. **Consent Form**

FIRST RECRUITMENT ANNOUNCEMENT

A FELLOW STUDENT NEEDS YOUR HELP!

- Have you ever used the Western Region University digital reference service?
- Did you participate in collaborative activities such as co-browsing and escorting when using the digital reference service?
- Would you like to share your likes and dislikes about your collaborative digital reference experience?
- To tell us about your collaborative digital reference experiences and/or to inquire further about this study, please contact Ruth Hodges at rah0082@garnet.acns.fsu.edu.

Thank you.

SECOND RECRUITMENT ANNOUNCEMENT

Earn $20 talking about your chat reference experience!

Who: Students attending the University Name who have used the University Library's Chat Reference Service.

Why: Your views are important and can be used to help improve chat reference services. Interviews will last about 1 hour.

How: If you are interested, please contact Ruth Hodges at Florida State University, rah0082@garnet.acns.fsu.edu for more details on her study on chat reference services and on how you can participate.

A prescreening questionnaire will be used to select participants for interviews.

PRESCREENING QUESTIONNAIRE

1. Please check your class level:

___ Undergraduate ___ Graduate ___ Medical resident ___ Other (please specify) _____

2. You have two or more years experience using the following applications (Please check all that apply):

___ Windows 98
___ Windows 2000
___ Windows XP
___ MacOS
___ MS Word
___Word Perfect
___ E-mail
___ Instant messaging
___ The Web
___ Internet chat
___ Other applications (please specify)_____

3. Is this the first time you have used the UCI chat reference service (please check one)?

____ Yes ___ No

4. Did you participate in any of the following activities during your encounter with the chat reference service (please check all that apply):

___ Receiving URLs
___ Sending URLs
___ Receiving Web page(s)
___ Viewing Web page(s)
___ Viewing Web page(s) with librarian
___ Clicking on links in Web page

5. How satisfied were you with your chat reference experience? (Please color highlight one below)

Completely satisfied	Very satisfied	Somewhat satisfied	Neutral	Somewhat dissatisfied	Very dissatisfied	Completely dissatisfied
7	6	5	4	3	2	1

6. Will you use this chat reference service again (please check one)?

____ Yes ____ Maybe ____ No

7. Please check below how your chat reference session ended, e.g. you:

____ disconnected ____ did not disconnect

The Impact of Collaborative Tools on Digital Reference Users: An Exploratory Study

CONSENT

I, freely and voluntarily and without any element of force or coercion, consent to be a participant in the study "Impact of Collaborative Tools on Digital Reference Users" conducted by Ruth A. Hodges, a doctoral student under the supervision of Professor Gary Burnett at the School of Information Studies at Florida State University.

I understand that the purpose of this research is to investigate the experiences of digital reference users who participate in co-browsing/escorting activities. This involves the simultaneous viewing of and/or interacting with Web sites; the OPAC; databases; and/or other online library resources during the digital reference encounter. You are being asked to participate in interviews, which will last one hour or less.

I understand that I will be asked to participate in a chat interview via the Internet, and I will be asked various questions about my co-browsing/escorting activities during the digital reference encounter. I also understand that I will be asked to respond to open question interviews. Only the research staff at Florida State University and the School of Information Studies will view the interview transcripts. Transcripts will be stored in a locked cabinet in locked offices and will be destroyed on or before December 2006. I understand that my participation is totally voluntary and that all my responses will be kept in confidence to the extent allowed by law. My name will not appear on any of the results. However, the interview results, without using my actual name on the reports may be published in journals or presentations.

I understand that if I have any questions concerning the study or my rights, I may contact Ruth Hodges at 1278 Strawberry Farm Road, Smoaks SC 29481 email rah0082@garnet.acns.fsu.edu, phone (843) 562-2157; I may contact her advisor Dr. Gary Burnett, Florida State University, School of Information Studies, 244 Shores Building, Tallahassee, Florida 32306-2100, email gburnett@lis.fsu.edu, Bus. Phone (850) 644-3801; or I may contact the Human Subjects Committee, Florida State University, Office of the Vice President for Research, Tallahassee, Florida 32306-2763, Bus. Phone (850) 644-8673, Fax (850) 644-4392.

I realize that my participation will help contribute toward the development of more user-friendly access, availability, and performance of digital reference services employing co-browsing/escorting activities. I understand that I will receive a check for $20 dollars within ten days of completing the interview.

I understand that this consent may be withdrawn at any time without prejudice or penalty. I have been given the right to ask and have answered any inquiry concerning the study. Questions, if any, have been answered to my satisfaction.

I have read and understand this consent form.

_____ _____

Name (printed) Name (signed)

_____

Date

I would like a copy of the study results. YES_____ NO_____

APPENDIX F: INTERVIEW GUIDE

INTERVIEW: AREAS OF FOCUS

INTRODUCTION

Hello guess #!
Thank you for joining me online today for this interview. As we begin the interview and as you comment, please let me know when you're done, ok?
Lets begin by talking about your last chat reference experience.

CHAT REFERENCE SERVICE IN GENERAL

- Can you tell me about your last chat reference experience?
    - What positive things happened during this chat reference interaction?
    - What negative things happened during this chat reference interaction?
    - Were these negative experiences overcome?
        - [if yes] How were they overcome?

USER – LIBRARIAN INTERACTION

Transition: Ok, now lets talk about your interaction with the librarian

- Can you tell me how the librarian facilitated the search for information during your chat reference encounter?
  [What values and attitudes do users express about the interaction]
    - What did the librarian do to facilitate your chat reference experience?
    - What did the librarian not do to facilitate your chat reference experience?
    - What is your perception of the librarian who assisted you during the chat reference session?

USER INTERACTION WITH THE TECHNOLOGY

Transition: Now, lets talk more about collaborative features used during digital reference (involve sending URLs and Web pages automatically opening on your desktop when sent or clicked on by librarian and vice versa).

- Can you tell me about when collaborative features were used during your chat reference experience?
    - What is your perception about having Web pages sent by the librarian automatically open on your desktop?
        - How did you feel when the Web page opened on your desktop?

- Do you prefer receiving a Web page or an URL during a chat reference session?
- How do you feel about viewing the Web pages along with the librarian during the chat reference session?
- How do you feel about co-browsing/escorting during the chat reference session?
  - What did you likes about co-browsing/escorting during the chat reference session?
  - What did you not likes about co-browsing/escorting during the chat reference session?
- How do you feel about sending URLs to the librarian during the chat reference session?
  - What did you like about sending URLs to the librarian during the chat reference session?
  - What did you not like about sending URLs to the librarian during the chat reference session?
- How do you feel about the librarian sending you URLs during the chat reference session?
  - What did you like about the librarian sending you URLs during the chat reference session?
  - What did you not like about the librarian sending you URLs during the chat reference session?

- How did these collaborative features impact your chat reference experience?

TERMINATION OF THE SESSION

Transition: Lets now talk about your leaving the chat reference session.

- Can you tell me how the chat reference session ended?

- How did you leave the chat reference session?
- Did you leave the chat reference service prior to the librarian entering the session with you?
  - Please tell me more
- What did you say prior to leaving the chat reference session?
- What did you do to end the chat reference session?
- Where did you go after leaving the chat reference session?
  - Where did you go inside the library?
  - Where did you go on the Web (computer)?

SERVICE IMPROVEMENT

- Overall, what is your perception of seeking information from a chat reference service employing collaborative features?

  - What do you perceive as strengths of such a chat reference service?
  - What do you perceive as weaknesses of such a chat reference service?

    - What would you like to see changed about chat reference services employing collaborative features?
    - What do you think would improve chat reference services employing collaborative features?

- Did you obtain the information you needed prior to leaving the chat reference service?
- Did you like the way the information was delivered?
    - Please tell me more about this
- Would you use this chat reference service again?

THANKS again guess # for participating in this interview! This will help us to improve the chat reference services.

APPENDIX G: CODING REPORT

NODE CODING REPORT

Node: /Dig collabor strategies~Facilitators/Educational Related/Demonstration

Description: Librarian outlines a series of steps or gives directives to assist the user on how to search, access a resource, complete an ILL and renewal forms, etc . Demonstrations may be visual or non-visual.

Documents in Set: Pilot_Test Set

Document 1 of 44 **PT_#1222711**
Passage 1 of 5 Section 1.1.1.14, Para 46, 32 chars.

46: OK, click on Article Database...

—

Passage 2 of 5 Section 1.1.1.16, Para 54, 25 chars.

54: Now click on the letter S

—

Passage 3 of 5 Section 1.1.1.18, Para 62, 59 chars.

62: Scroll down and click on the Sociological Abstracts link...

—

Passage 4 of 5 Section 1.1.1.20, Para 70, 39 chars.

70: now click on the Univ=Univ Name link...

—

Passage 5 of 5 Section 1.1.1.32, Para 110, 55 chars.

110: to find that out, just click on the UNIV eLinks box....

—

Document 5 of 44 **PT_#1414654**
Passage 1 of 12 Section 1.1.1.9, Para 30, 30 chars.

30: Ill tell you how to get to it

—

Passage 2 of 12 Section 1.1.1.11, Para 36, 58 chars.

36: from our homepage click on "Opac" catalog(top left in box)

—

Passage 3 of 12 Section 1.1.1.13, Para 42, 75 chars.

42: at search menu click "Selet Collection" and limit to "Journals and Serials"

—

Passage 4 of 12 Section 1.1.1.14, Para 45, 33 chars.

45: then search Title: New York Times

—

Passage 5 of 12 Section 1.1.1.16, Para 51, 128 chars.

51: select the one that says "New York Times [microform]" and then click "LAtest received" in the full record; that's how I found it

---

—

Passage 6 of 12 Section 1.1.1.35, Para 116, 79 chars.

116: ok, in that case go back to the libraries homepage an click "Article Databases"

—

Passage 7 of 12 Section 1.1.1.36, Para 119, 56 chars.

119: ...then scroll down to Suggestions to get you started...

—

Passage 8 of 12 Section 1.1.1.38, Para 125, 78 chars.

125: and select LExis-NExis (middle left column); let me know if i"m going too fast

---

—

Passage 9 of 12 Section 1.1.1.40, Para 131, 46 chars.

131: then click the Guided News Search tab in Lexis

—

Passage 10 of 12 Section 1.1.1.41, Para 134, 79 chars.

134: see the dropdown menus...Step One: choose General News. Step two: Major Papers
135:

—

Passage 11 of 12 Section 1.1.1.43, Para 140, 66 chars.

140: Step three: enter article title. Step Five - enter New York Times.

—

Passage 12 of 12 Section 1.1.1.46, Para 149, 106 chars.

149: 3 look to college suit to show their merits; plaintiffs hope to prove they belonged:: i put this in step 3

—

Document 15 of 44 **PT_#524579**
Passage 1 of 11 Section 1.1.1.48, Para 159, 20 chars.

159: ok type in the title

—

Passage 2 of 11 Section 1.1.1.52, Para 173, 58 chars.

173: let us go back to "current protocols in molecular biology"

—

Passage 3 of 11 Section 1.1.1.53, Para 176, 18 chars.

176: type in this title

—

Passage 4 of 11 Section 1.1.1.55, Para 182, 27 chars.

182: replace protective immunity

—

Passage 5 of 11 Section 1.1.1.58, Para 193, 19 chars.

193: Ok click on the /31

—

Passage 6 of 11 Section 1.1.1.60, Para 199, 10 chars.

199: click on 3

—

Passage 7 of 11 Section 1.1.1.61, Para 202, 1 chars.

202: 3

—

Passage 8 of 11 Section 1.1.1.62, Para 205, 1 chars.

205: 3

—

Passage 9 of 11 Section 1.1.1.66, Para 223, 25 chars.

223: click on return to browse

—

Passage 10 of 11 Section 1.1.1.72, Para 247, 14 chars.

247: now click on 1

—

Passage 11 of 11 Section 1.1.1.76, Para 265, 101 chars.

265: Ok now if you click on [Univ name] you will get into the title, however let us move to the next title

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APPENDIX H: IRB APPROVAL

Florida State
UNIVERSITY

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2763
(850) 644-8633· FAX (850) 644-4392

REAPPROVAL MEMORANDUM

Date: 9/22/2005

To:
Ruth Hodges
1278 Strawberry Farm Rd.
Smoaks, SC 29481

Dept.: **INFORMATION STUDIES**

From: **Thomas L. Jacobson, Chair**

Re: **Reapproval of Use of Human subjects in Research: Collaborative Tools on Users of Digital Reference**

Your request to continue the research project listed above involving human subjects has been approved by the Human Subjects Committee. If your project has not been completed by 9/20/2006 please request renewed approval.

You are reminded that a change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must report to the Chair promptly, and in writing, any unanticipated problems involving risks to subjects or others.

By copy of this memorandum, the Chairman of your department and/or your major professor are reminded of their responsibility for being informed concerning research projects involving human subjects in their department. They are advised to review the protocols of such investigations as often as necessary to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

Cc: Dr. Gary Burnett
HSC No. 2005.732-R

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Yonaitis, Robert B. 2001. *Understanding internet traffic*. Concord, NH: HiSoftware Publishing.

BIOGRAPHICAL SKETCH

RUTH A. HODGES

EDUCATION

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PROFESSIONAL EXPERIENCE

COORDINATOR OF BIBLIOGRAPHIC INSTRUCTION/ ASSISTANT PROFESSOR - South Carolina State University - Orangeburg, SC, 1996 – 1999, 2005 - Present.

CHIEF LIBRARIAN - D.C. General Hospital - Washington, DC, 1995 - 1996.

PHARMACY/REFERENCE LIBRARIAN - Howard University - Washington, DC, 1992 - 1994.

CONTRACT INDEXER - Freelance - Greenbelt, MD, 1987 - 1992.

ASSOCIATE LIBRARIAN - National Academy of Sciences (NAS) - Washington, DC, 1985 - 1987.

ASSISTANT LIBRARIAN - Howard University - Washington, DC, 1982 -1985.

ENTOMOLOGY LIBRARIAN - Smithsonian Institution - Washington, DC, 1981 -1982.

BIOLOGIST - National Institutes of Health - Bethesda, MD, 1979 - (Summer Internship).

PUBLICATIONS

Hodges, Ruth A. 2002. *Assessing Digital Reference*. *Libri* 52: 157-168 (Refereed)

Gross, Melissa, McClure, Charles, Hodges, Ruth, Graham, Antoinette, and Lankes, R. David. 2002. *Phase II: Site Visit Summary Report*, School of Information Studies, Florida State University.

ACADEMIC HONORS AND AWARDS

Title III Faculty Development Grant, IMLS Outcomes Assessment Institute Fellow, *Libri's* Honorable Mention *Best Student Paper*, NASA Travel Award, Faculty Travel Award - Center for Network Resource Training (CNRT), NLM Medical Informatics Fellow, Beta Kappa Chi Honor Society, Biology Honor Society, Title II Fellowship.

TEACHING ASSISTANT AND RELATED EXPERIENCES

Research Methods in Information Services
Instructional Role of the Information Specialist
Technology for Information Services
Research Assistant for the Quality Assessment Grant