

## **IMLS Final Performance Report June 28, 2008**

**Submitted: June 28, 2008**

**Award Number:**

✓ LG-06-05-0109-05

**Awardee Institution Names (Partnering Organizations):**

- ✓ Rutgers, The State University of New Jersey
- ✓ OCLC Online Computer Library Center

**Final Performance Report:** From October 1, 2005 to June 28, 2008

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**PROJECT OVERVIEW:**

“Seeking Synchronicity: Evaluating Virtual Reference Services from User, Non-user, and Librarian Perspectives” (Radford & Connaway, 2005) was undertaken with the goals of evaluating the practice, sustainability, and relevance of virtual reference services (VRS). VRS are human-mediated, Internet-based, synchronous library information services. The rapidly increasing use of remotely accessed, digital reference resources has increased the demand for librarians to provide reference services online. VRS users, non-users and librarians provided data for this research in focus group interviews, online surveys, telephone interviews, and VRS session transcripts. The project provided findings regarding user and librarian preferences, process and usability issues related to technology, and content issues related to information accuracy and query negotiation. In addition, the project results inform the understanding of computer-mediated communication, the impact of virtual relationships, and generational differences in information seeking using live chat technology.

Table of Contents

<b>PROJECT NARRATIVE</b>	
PROJECT ACTIVITIES .....	3
PROJECT AUDIENCE .....	5
PROJECT ANALYSIS .....	6
Project Achievements .....	6
Lessons Learned .....	13
Learning Outcomes .....	15
Project Impact .....	15
FURTHER RESEARCH OPPORTUNITIES .....	16
References .....	17
 <b>APPENDICES</b>	
Appendix A: Project Timeline .....	20
Appendix B: Summary of Participant Demographics .....	21
Appendix C: Recruitment Documents and Consent Forms .....	24
Appendix D: Focus Group Interview Guidelines and Questions.....	41
Appendix E: Coding Scheme for Question Classification .....	43
Appendix F: Coding Scheme for Question Subject.....	45
Appendix G: Coding Scheme for Relational Content.....	48
Appendix H: Coding Scheme for Query Clarification .....	55
Appendix I: Coding Scheme for Ready Reference Accuracy .....	60
Appendix J: Online Survey Instruments .....	63
Appendix K: Coding Scheme for Critical Incidents .....	79
Appendix L: Telephone Interview Questions.....	83
Appendix M: Project Outcomes.....	90
Appendix N: Project Website Hits.....	96
Appendix O: Theoretical Model .....	97
Appendix P: List of Project Staff.....	100
Appendix Q: Best Practice Guidelines for Librarian Providers of VRS .....	101
Appendix R: Recommendations for Facilitating Interpersonal Communication in Chat Reference Encounters.....	104

## **PROJECT ACTIVITIES:**

The project “Seeking Synchronicity: Evaluating Virtual Reference Service from User, Non-User, and Librarian Perspectives” consisted of four phases of data collection and analysis, lasting from October 1, 2005 to March 29, 2008. It used a logical sequence in the process of data collection, with each phase informing the next (see Appendix A for a diagram of the project timeline). Towards this goal, Phase I focus group interviews were conducted with librarian VRS providers, as well as both non-users and users of VRS. In Phase II a process was developed to gather a random sample of 24/7 Reference Cooperative and OCLC QuestionPoint<sup>1</sup> VR transcripts, which were cleaned and underwent several analyses to address the proposal’s research questions. During Phase III, online surveys for each demographic cohort (user, non-user, and librarian) were created, with questions developed from the focus group interview data and from the initial research questions specified in the grant proposal. Following the online surveys, Phase IV consisted of individual telephone interviews for each cohort. Telephone interview instruments were constructed which were informed by both the focus group interviews and online survey results.

For Phase I, a total of eight focus group interviews were conducted, two each with librarians and users, and four with non-users (see Appendix B for a summary of all participant demographics, and Appendix C for recruitment documents and consent forms signed by the participants). Focus group interviews have been used extensively in social science research (Krueger & Casey, 2000) and in library and information science research and practice (Powell & Connaway, 2004; Connaway, 1996). Although focus group interview data cannot be generalized to an entire population, the methodology is frequently used for identifying perceptions and attitudes of a target population (Powell & Connaway, 2004). Librarians (who participated in two focus group interviews, 11/13/2005 and 1/20/2006) were recruited by advertising on professional listservs, on librarian networks, and during professional conferences. Users (two focus group interviews, 6/05/2006 and 7/11/2006) and non-users (four focus group interviews, 11/19/2005, 3/26/2006, 5/1/2006, and 3/15/2006) were recruited by flyers posted on the campus of Rutgers University, by postings to academic listservs, and at public libraries. A separate set of questions was developed for each of the three cohort groups (for focus group interview guidelines and questions, see Appendix D). During each focus group session, the moderator occasionally encouraged the group to come to a consensus on a particular statement or idea that appeared to resonate with the majority. The focus group sessions were transcribed, and major themes were extracted from the data. Results were used to inform construction of the online survey and telephone interview instruments. Three focus group interviews were conducted with members of the “Millennial” Generation, born between 1982 and 2000 (Howe & Strauss, 2003). The responses from the youngest Millennials, used here for those aged 12-18 and known as “screenagers” (see Rushkoff, 1996) suggested that this group had different expectations for services and systems than the other demographic groups; therefore, additional focus group interviews

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<sup>1</sup> The 24/7 Reference Cooperative is a global network of VRS librarians designed to offer services around the clock. It merged with the OCLC QuestionPoint service in August, 2004.

with screenagers were conducted and teenagers also were specifically recruited for the online surveys and telephone interviews.

For Phase II, VRS transcripts were gathered from the 24/7 Reference Cooperative and OCLC QuestionPoint databases in two sub-phases (for a preliminary study, see Radford, 2006). From July 2004 through June 2005, a random sample of 25 transcripts was taken each month from a database of over 263,673 VRS sessions. In addition to these 300 transcripts, a second random sample of 50 transcripts was taken from a database of over 250,000 VRS sessions for each month between December 2005 and November 2006, resulting in a further 550 transcripts. The two groups, with a total of 850 transcripts, were cleaned of identifying information and subsequently analyzed. Basic information such as length of session, type and location of library receiving the question, type and location of librarian answering the question, and general education level of VRS user was coded. Analyses were conducted to determine the type of questions asked using a modified question classification scheme (see Appendix E; Katz, 1997; Kaske & Arnold, 2002), and the subject of the questions using the Dewey Decimal Classification (2003) top 100 divisions (see Appendix F). The transcripts also were analyzed for relational content using the Radford Relational Coding Scheme (see Appendix G). The VRS transcripts proved to contain a wealth of information, and these data were used to construct new coding schemes and to consider additional aspects of VRS service and interaction. As a direct result of the transcript analysis, two new coding schemes were created and applied, including the Query Clarification Coding Scheme and Ready Reference Accuracy Coding Scheme (see Appendices H and I).

During Phase III, online survey instruments were developed from focus group interview data, and from the initial research questions. A separate online survey was developed and pretested for each of the three cohort groups (See Appendix J for the online survey instruments). A total of 496 online surveys were completed. Recruitment of participants was accomplished through multiple means for each of the three cohorts. Librarians were recruited through professional electronic mailing lists and VRS librarian networks, as well as through announcements at local and national conferences. Non-users were recruited through postings on college electronic mailing lists, with flyers posted on the campuses of Rutgers University and Ohio State University, and through links on library homepages. Personal connections also were used to recruit Millennials (specifically screenagers) for participation to further develop the interesting findings from this demographic group’s focus group interview data. Users were recruited through links on the QuestionPoint homepage, links in the VRS session closing scripts, and through e-mail messages sent to users through a statewide VRS provider. The respondents in each demographic category provided both quantitative and qualitative data. These data were thoroughly analyzed using descriptive statistics for the quantitative data, and grounded theme analyses (Charmaz, 2006) and the Critical Incident (CI) Technique (see Appendix K for coding scheme, and Flanagan, 1954) for qualitative data. Grounded theme analyses reveal themes which emerge from the participants’ own words, in this case their answers to free-response questions. The CI technique identifies specific strengths and weaknesses, and the features that instill perceptions of success in single, individual encounters.

**“Seeking Synchronicity: Evaluating Virtual Reference Service from User, Non-user, and Librarian Perspectives”** LG-06-05-0109-05

To conclude the project with Phase IV, telephone interview questions for all three groups were developed from participant responses in the focus group interviews and to the online surveys, as well as from the initial research questions (See Appendix L for telephone interview questions). Interviews usually produce a better response rate than mail or e-mail questionnaires and provide the opportunity to probe and to correct misunderstandings, as well as to reveal more complex information (Powell & Connaway, 2004). Librarians were recruited through professional electronic mailing lists and VRS librarian networks, as well as through announcements at local and national conferences. Non-users were recruited through postings on college electronic mailing lists, with flyers posted on the campuses of Rutgers University and Ohio State University, and through links on library homepages. Personal connections were used to help in the recruitment of Millennials (specifically screenagers). Users were recruited through links on the QuestionPoint homepage, links in the VRS session closing scripts, and through e-mail messages sent to users through a statewide VRS provider, facilitated by one of our External Board members, Joseph Thompson of MarylandAskUsNow! Again, a separate set of interview questions was developed and pretested for each of the three study groups. A total of 283 telephone interviews were completed. Analysis is nearing conclusion for the interview transcripts using grounded theme analyses (Charmaz, 2006), and the Critical Incident Technique (Appendix K; Flanagan, 1954).

**PROJECT AUDIENCE:**

The research design of the four phases of the project ensured rapid and on-going dissemination to multiple audiences. Each phase of the data collection and its associated analysis were disseminated publicly, not only to share the findings, but also to gather feedback. The research team successfully sought numerous international, national, regional, and local conference venues to share findings from each of the grant’s four phases (see Appendix M for a bibliography of project outcomes). The project website also enabled global access to our reports and presentation materials (see Appendix N for a tabulation of project website hits). The audiences included scholars in the field of library and information science or communication, and library professionals. Additionally, project related insights and data were shared continually among each investigator’s colleagues.

## **PROJECT ANALYSIS:**

### **Project Achievements**

This study has addressed seven research questions that were derived from the gaps uncovered in a review of the literature, and it has sought the following twelve results:

1. To answer the following research questions:
  - a. What are the critical factors that influence users’ decisions to select and use VRS? Why do non-users opt to use other means?
  - b. What are the critical factors that determine users’ perceptions of success and satisfaction in VRS?
  - c. How do users and librarians differ in their perception of factors critical to their perceptions of success and satisfaction?
  - d. What is the relationship between information delivered/received (task/content) and interpersonal (relational) dimensions of VRS in determining perceptions of satisfaction/success?
  - e. What is the impact of the use of prepared scripted messages on satisfaction/ success (e.g., “Welcome to our service, a librarian will be with you in a few minutes.”)? Do impersonal scripted messages impact user behavior (e.g., promote rude behavior)?
  - f. How does users’ satisfaction with face-to-face reference encounters compare to satisfaction with reference encounters in virtual environments (including chat and email)?
  - g. How do users express satisfaction? Do overt “thank you” messages equal satisfaction/success?
2. To identify research-based practices for attracting additional users to VRS.
3. To understand what users want from VRS in order to develop more effective services that meet the users’ information needs and ensure their satisfaction.
4. To collect information from individuals from diverse cohort groups who are infrequently sampled in LIS research (including non-users, international users, etc.).
5. To provide research-based guidelines to inform VRS practice and policy.
6. To refine Radford’s recommendations for improving interpersonal communication in VRS for both librarians and users.
7. To identify factors critical to successful VRS interactions and to develop guidelines and recommendations for evaluation of VRS.
8. To provide a snapshot of VRS and users in a time of rapid change and ongoing development.
9. To inform software development and interface design.
10. To develop a research agenda and to serve as a foundation for future research projects in user-centered VRS.
11. To develop a theoretical model for VRS that incorporates interpersonal (relational) aspects as well as information (content) aspects.
12. To provide opportunities to develop research skills and research agendas for masters and doctoral students.

Even from preliminary data analysis, the project has produced answers to each research question, and has achieved results in each category.

1. Research questions:

- a. What are the critical factors that influence users’ decisions to select and use VRS? Why do non-users opt to use other means?

Across every data collection phase, users cite the **convenience of VRS** as the most important factor influencing their decision to use the service; it was the single most important feature discussed in the focus group interviews. Online survey respondents called convenience an extremely important feature. 80% (110) rated convenience as “very important,” and 17% (23) rated it as “important;” 60% (45) of telephone interviewees also agreed. Many users specifically valued **availability after hours** on the online survey: 74% (101) rated this as “very important” or “important.” Respondents to the online survey 16% (22) critical incident question and telephone interviewees 30% (23) mentioned VRS as important **when they cannot get to a library**.

The single greatest factor for VRS non-use is **not knowing that the service was available**. 74% (135) of online survey respondents either “strongly agree” or “agree” with this statement, and 59% (107) **do not know what chat reference is**. 20% (36) asked for more information about the service in free-response questions. 27% (29) of telephone interviewees **did not know electronic means of communicating with a librarian were available**. Focus group interview participants claimed **recommendations from trusted sources** (family, friends, and professors) **and marketing campaigns** could influence their decisions to use VRS.

Similar to users’ reasons for using VRS, **issues of convenience** might also influence non-users' future decisions to use VRS (61%, 65 of telephone interviewees): **needing immediate answers** (30%, 32 of telephone interviewees), or **using VRS from home** (17%, 18 of telephone interviewees; 13%, 22 in online survey) **or after hours** (7%, 7 of telephone interviewees; 12%, 20 in online survey).

Some respondents are driven to choose other reference formats by the **perception that a librarian is too busy** (60%, 36 “agree” or “strongly agree” that this influences a decision to choose electronic formats, and 50%, 14 for the telephone). **Fears of annoying or overwhelming a librarian** are *not* factors which keep them away from VRS (75%, 145 and 71%, 142 “disagree” or “strongly disagree” with these statements).

- b. What are the critical factors that determine users’ perceptions of success and satisfaction in VRS?

As noted above, the voluminous data collected over the course of the project has led to a protracted evaluation period. Results to date indicate a number of factors that determine user's perceptions of success and satisfaction. Users noted **receiving an answer to their**

**question or a source they were seeking** as related to their positive experiences with VRS (online survey positive Critical Incidents: 43%, 59). Users also indicated receiving **quick, timely, or prompt help** as important to their positive experiences with VRS (39%, 53). In describing negative experiences with VRS, users noted **not receiving an answer or source** as key to their lack of success (online survey negative Critical Incidents: 41%, 30).

- c. How do users and librarians differ in their perception of factors critical to their perceptions of success and satisfaction?

While the data on users' perceptions of success is still preliminary, librarians appear to concur with users in **equating "locating resources" with success** (63%, 108). Librarians also claim that some **users do thank** them (30%, 51), and value the process of **guiding users to information** (33%, 57). Librarians focus on users in their perceptions of the major causes for lack of success: **impatient users** (60%, 105 of cases), **unrealistic expectations** (58%, 101), **obscure questions** (47%, 82), and **not being able to find an answer** (45%, 79).

- d. What is the relationship between information delivered/received (task/content) and interpersonal (relational) dimensions of VRS in determining perceptions of satisfaction/success?

The results of the Critical Incident analysis indicate that a combination of both content and relational dimensions is important for determining perceptions of satisfaction/success. For all three cohort groups, a combination of success in both dimensions was most prevalent when participants were asked to describe a successful reference encounter. Librarians, as well as users, highly value information delivered/received. A greater proportion of users were found to value content in VRS above those in face-to-face (FtF) critical incident analyses (see Radford 1993, 1999). Relational dimensions are highly important as well, with librarians being especially sensitive to the user's attitude in perceptions of unsuccessful VRS critical incidents. This also had been found to be the case in FtF reference (see Radford 1993, 1999).

- e. What is the impact of the use of prepared scripted messages on satisfaction/ success (e.g., “Welcome to our service, a librarian will be with you in a few minutes.”)? Do impersonal scripted messages impact user behavior (e.g., promote rude behavior)?

When directly asked about scripted messages, a surprisingly large number of users indicated that they **did not mind, or even liked, scripted messages** (80%, 56 of telephone interviewees). Users felt that scripted messages, especially the example script given in the question above, “Welcome to our service, a librarian will be with you in a few minutes,” provided an acknowledgement of the user's presence (23%, 16), and felt that scripts were not a problem if librarians **weren't overusing** them (16%, 11). Those

who reported **disliking scripted messages** (14%, 10) did not care for the **impersonal communication** (6%, 4) that they represented.

- f. How does users’ satisfaction with face-to-face reference encounters compare to satisfaction with reference encounters in virtual environments (including chat and e-mail)?

When queried directly about their relative satisfaction, users indicated mixed preferences for VRS or FtF reference services. Those **preferring VRS** (38%, 28 of online survey respondents) did so because of the **immediacy or convenience of chat** (15%, 11) or because of their **increased ability to communicate** in VRS (15%, 11) as the **focus of the librarian's attention** (9%, 7). Those **preferring FtF** (18%, 13) felt that there was **clear communication** with the librarian in this mode (12%, 9). The large number of users who did not have a clear preference (41%, 30), saw a multitude of strengths and weaknesses in both FtF and VRS, including **immediacy or convenience** in VRS (9%, 7), and **receiving resources or answers** in FtF (9%, 7).

- g. How do users express satisfaction? Do overt “thank you” messages equal satisfaction/success?

When directly asked about how they ended their chat interactions, users claimed to very often **thank the librarian** (80%, 59 of telephone interviewees). This finding seems to contradict observed user practice in the VRS transcripts where **thanks were found to be offered in slightly over half of the transcripts** (54%, 408). Some users also claimed to express satisfaction in other ways: **confirming the information received is satisfactory** (11%, 8), **offering other general courtesies** (9%, 7), and **expressing enthusiasm for the service** (7%, 5).

2. Research goal: To identify research-based practices for attracting additional users to VRS.

Following directly from the findings noted above, both VRS users and non-users make choices among information systems based upon **convenience** and the **immediacy of answers**. The single greatest factor for non-use is lack of knowledge that the system is available. **Greater marketing of VRS** is recommended, especially to highlight the convenience and immediacy of VRS, which are so important to the users. Marketing that emphasizes the safety and confidentiality of VRS could also attract younger users as well as university students, according to the results of the focus group interviews.

3. Research goal: To understand what users want from VRS in order to develop more effective services that meet the users’ information needs and ensure their satisfaction.

In addition to the research findings noted above, data collection from VRS users revealed other features which are important to them for future enhancements. These include **software that is faster** (77%, 106 “very important” or “important”), **easier to use** (73%, 100), **agile** (72%, 99), and **stable** (69%, 94). Other important requests included **better browser compatibility** (75%, 103), **more experienced librarians** (73%, 100), **more librarians** (68%, 93), **more hours of service** (68%, 93), **broadband internet access** (68%, 93), **more bookmarks and links** (64%, 88), and **more reliable co-browsing** (61%, 83). The 12-18 year-olds (the screenagers) were more likely to request the following: personalization (69%, 18), other languages (50%, 13), Voice Over Internet Protocol (VOIP: 69%, 18), better color and organization of the site (65%, 17), satellite access (84%, 22), and availability on cell phones (61%, 16). This group also was more open to trying different modes of offering chat reference such as concierge-type kiosks, centralized information commons, and cyber cafes.

4. Research goal: To collect information from individuals from diverse cohort groups who are infrequently sampled in LIS research (including non-users, international users, etc.).

This research succeeded in sampling a large number of VRS non-users. The recruitment process used several different methods to access a diverse population for participation in data collection. Transcript analysis included international users from eight non-U.S. countries including Australia, England, China, Israel, Germany, and Slovenia. See Appendix B for a complete demographic summary of the participants for the focus group interviews, online surveys, and telephone interviews.

5. Research goal: To provide research-based guidelines to inform VRS practice and policy.

Updated sets of research-based recommended guidelines for VRS librarian providers and their networks were developed and were disseminated to the community via a number of national and international conferences and the project website. These included general guidelines as well as guidelines for dealing with rude or impatient users. See “Learning Outcomes” below and Appendix Q for a more complete discussion.

6. Research goal: To refine Radford’s recommendations for improving interpersonal communication in VRS for both librarians and users.

Data analysis prompted a complete revision of the Radford Relational Coding Scheme; see Appendix G. The revised Coding Scheme was used to inform the updating of the research-based recommended guidelines (see #5 above).

**“Seeking Synchronicity: Evaluating Virtual Reference Service from User, Non-user, and Librarian Perspectives”** LG-06-05-0109-05

7. Research goal: To identify factors critical to successful VRS interactions and to develop guidelines and recommendations for evaluation of VRS.

All three cohorts were asked to provide examples of both positive and negative encounters with reference librarians in the online surveys, and librarians and users were asked again in telephone interviews. Results from the Critical Incident analysis as well as the transcript analysis have identified content and relational factors that are critical to successful interactions. These have been integrated into the theoretical model (see Appendix O).

8. Research goal: To provide a snapshot of VRS and users in a time of rapid change and ongoing development.

The in-depth transcript analysis has provided a snapshot of the types of questions, the subject of questions, the level of accuracy, and the amount of query clarification that constitute current VRS practice. Current use of chat conventions and compensation for the lack of nonverbal cues has also been documented in the transcript analysis. Interview and survey data have captured a snapshot of user, non-user, and librarian attitudes and preferences regarding VRS. Additionally, project data analysis has frequently highlighted the differing experiences and preferences regarding VRS demonstrated by two large age demographics: the Baby Boomers and the “Millennials” (Strauss & Howe, 1991; Howe & Strauss, 2000). The two generations’ contrasting information behaviors and preferences have been presented at numerous national and international conferences (see Appendix M).

9. Research goal: To inform software development and interface design.

Project data, results, and recommendations have been widely disseminated to practitioners and developers, via national and international conferences, the project website, and professional publications. Feedback at conferences has been especially vibrant.

As previously stated, the single greatest factor for VRS non-use is **not knowing that the service was available**. This finding suggests that librarians need to promote and market VRS and to prominently display the icon for the service on library web sites and in social networking environments. Although librarians understand the icon and moniker, “Ask a Librarian,” users do not necessarily know that clicking on this icon will provide them with 24/7 reference service.

These findings indicate that VRS providers need to provide options for personalization of the service, VOIP, and interfaces that provide color and organization that appeals to this younger generation. Developing software for cell phones should be a priority for VRS providers and librarians should experiment with VRS kiosks, centralized information commons, and cyber cafes for chat reference.

10. Research goal: To develop a research agenda and to serve as a foundation for future research projects in user-centered VRS.

During the course of project data analysis, several coding schemes were developed for the evaluation of VRS transcripts and users’ experience of VRS: the Query Clarification Coding Scheme, the Ready Reference Accuracy Analysis, the Critical Incident Coding Scheme, and a revision to the Radford Relational Coding Scheme (see Appendices G, H, I, and K). Analysis of the extremely rich project data is ongoing, and will be leading to presentations and publications in the future. Numerous project presentations and the publications to date have suggested areas for a future research agenda, including more research into Millennial information-seeking and on-line behavior, research that compares VRS via chat software such as QuestionPoint to that of generic instant messaging (IM) services, and research that investigates instruction in VRS.

11. Research goal: To develop a theoretical model for VRS that incorporates interpersonal (relational) aspects as well as information (content) aspects.

A model was developed that incorporates interpersonal (relational) aspects as well as information (content) aspects; see Appendix O.

12. Research goal: To provide opportunities to develop research skills and research agendas for masters and doctoral students.

Over the duration of the grant, one doctoral student received full-time support and experience as project manager, and a mix of twelve doctoral and master’s students received opportunities in recruitment, data collection and analysis, research software use, and the preparation of research presentations, reports, and publications (see Appendix P for a list of grant staff).

Finally another goal of the project was to disseminate the results in at least six **national or international conferences**. This expectation has been exceeded, with (to date) 47 public presentations and 11 published research reports completed (see Appendix M for a bibliography of project outcomes, and Part 9 for copies of each).

### **Lessons Learned**

Overall, the project succeeded in tapping into a large population of VRS users, non-users and librarians, and collecting data to address the grant research questions and beyond. While the data collection goals have been met, the project is requiring additional time to analyze the copious amounts of raw data remaining.

Through the periods of data collection and analysis for the project, a number of **positive aspects** of our research process became apparent.

- Full time project manager was essential for managing logistics, budget, personnel, etc.
- Weekly team meetings kept our 2-state team cohesive and focused.
- Timeline of deadlines and target dates helped to keep us on track.
- The diversity of the team (Millennials, Boomers, Gen Y) informed our decisions and interpretation of data.
- Research design was powerful and the project generated extremely rich data.
- We decided to expand from 3 focus groups to 8 focus groups. The focus group results had a profound influence on the subsequent 3 phases, including the transcript analysis where we decided to do an analysis by generation and had interesting results.
- Strong theoretical foundation guided all phases of study, instrument design, and data analysis
- Grant proposal’s research questions were well designed and kept our data collection and analysis on track.
- Project results stimulated interest which led to multiple invited presentations and multiple acceptances of proposals.
- Seeking Synchronicity website was an excellent way to disseminate results and measure outcomes (in terms of site hits and downloads, see Appendix N).
- Internal and External Advisory members were well selected and invaluable for the success of this project. External Advisory board was helpful in every phase of the grant, especially when we ran into the problem of recruitment of users.

Conversely, a number of **unexpected challenges** related to data collection and analysis were encountered that should be addressed to improve future projects of this type.

- Recruitment took much longer than expected for users and non-users. (Librarians, on the other hand, were easily recruited, perhaps because of their vested interest in VRS.)
- User recruitment was problematic for online surveys and telephone interviews because of privacy issues. We could not get lists of user e-mail or names as these are kept confidential by the live chat services.
  - User recruitment should have begun much earlier (6 months ahead at least).
  - For telephone interviews, users and non-users frequently missed appointments for the telephone interviews; therefore, this process also

took longer than expected since the team had to be persistent and reschedule multiple times with some participants.

- A larger monetary payment should have been offered for recruitment of users and non-users. The \$25 for online surveys and \$30 for telephone interviews was too low as an incentive to people with busy lives. \$50 would have been better. (\$50 for focus group interview recruitment was adequate. Some librarians refused payment and it is possible that they would have participated without monetary compensation or for a lesser amount).
- Time originally allowed for phases of research was underestimated.
  - We requested and were given a 6-month extension. However, we should have asked for a 12-month extension.
  - Original grant request should have been for 3 years.
  - Work is continuing past grant period (analysis and writing of additional publications).
- Our first attempt to develop a collaborative project Wiki was not user-friendly enough, and required redesign which better met the team's needs.
- NVivo 7 (analysis software) did not deliver the features and ease of use that was promised. Their customer support was practically non-existent. The recently released NVivo 8 seems to be better, but was issued at the end of the project. This software had severe limitations which limited our ability to efficiently manipulate large data sets. Software use was not intuitive and there is a large learning curve for its use that prevented us from training the entire team. Analysis had to be done in stages and is extremely time consuming. Research team members spent inordinate time in running (what should have been) routine reports.
- The original assignment of random numbers for online survey respondents was confusing; therefore, a time-consuming re-numbering was necessary.
- Intercoder reliability tests were difficult with teams in two states. We should have had more one-on-one and group coding sessions with a question and answer period before coding began for each project.
- PI from Rutgers underestimated time commitment and should have built in release time from teaching for several semesters. The PI had no release time and so continued a full teaching load throughout the grant. Summer work was heavy and continues to be heavy past grant period. Time management issues also arose in balancing effort between data collection and early dissemination of results.
- We should have budgeted for team travel, to better effect training and team coding.

### **Learning Outcomes**

One intended result of this study was the development of research-based guidelines to help inform VRS practice and policy (see Appendices Q and R) These guidelines can be viewed as a set of best practices to be implemented by librarians working as part of a VRS cooperative, and by librarians working individually with any VRS user. The guidelines have been disseminated to working librarians at several national and international conferences, and via the grant website. In addition, as an unexpected benefit, a number of survey and interview participants expressed an interest in trying VRS (for non-users), or in using it more frequently (for those who were users already). For example, one non-user online survey respondent said: “I will try chat references, because it seems like an easy and convenient way to get my questions answered.” (NOS-80208) One non-user telephone interviewee echoed this sentiment: “Well, I think you have convinced me. The fact that our weather here isn’t conducive to going to the library all of the time. Weather here today, it is pouring out. They may be able to help you, can help you pull up on your computer. It has made them more accessible.” (NTI-21)

### **Project impact**

The project impacts VRS providers, as well as library and information science professionals and scholars at large. The findings from the multi-phased study have resulted in several new coding schemes for VRS – the Query Clarification Scheme, the Ready Reference Accuracy Analysis, the Critical Incident Technique Coding Scheme, and the revision of the Radford Relational Coding Scheme. These coding schemes can be used by practicing VRS librarians and cooperatives to evaluate services, and by researchers in future studies.

As previously discussed, the identified attitudes and behaviors of the Millennials (specifically screenagers) are extremely valuable to librarians in order to develop systems and services to attract these potential future library users and to retain current users. The suggested new modes of VRS delivery have the potential to move VRS into new technological and social environments.

The results of the project were utilized to develop research-based guidelines to inform VRS practice and policy. These guidelines provide best practices that can be implemented by librarians working as part of a VRS cooperative or working individually with any VRS user.

The new theoretical model also will provide an opportunity for library and information science researchers to test and validate in future work that studies reference in virtual and FtF venues.

**FURTHER RESEARCH OPPORTUNITIES:**

The co-investigators plan to continue to analyze the data and to construct cross tabulations to better link demographic characteristics to behaviors and perceptions. The richness of the data will allow for additional analyses, including, for example, the possibilities of revisiting the transcripts with the goal of understanding the role and effectiveness of instruction in VRS.

Several publications and additional presentations are in progress or being planned to disseminate the major findings of the project. These findings will be presented to the library, communication, and education communities and submitted for publication in professional and scholarly venues.

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Special thanks to those who contributed time and effort to the preceding report: Jocelyn DeAngelis Williams, Project Manager (10/2005 – 03/2008), Timothy J. Dickey, Project Manager (04/2008- ), Patrick Confer, Grant Research Intern, Robert Bolander, Jeremy Browning, and Erin Hood.

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**“Seeking Synchronicity: Evaluating Virtual Reference Service from User, Non-user, and Librarian Perspectives”** LG-06-05-0109-05

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