

ITEM SAMPLING IN SERVICE QUALITY ASSESSMENT SURVEYS TO IMPROVE
RESPONSE RATES AND REDUCE RESPONDENT BURDEN:
THE "LibQUAL+® Lite" RANDOMIZED CONTROL TRIAL (RCT)

BY

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DISSERTATION

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ABSTRACT

The purpose of the study was twofold: (a) identifying whether item sampling using matrix sampling methods improved the well-known survey protocol, LibQUAL+®, and produced a viable alternative, LibQUAL+® Lite; in particular, improvements regarding participation rates, completion time for the survey, and results comparisons are examined in the Lite version of the protocol within different institutional settings through a series of randomized control trials; (b) identifying whether there are differences in the total, subscale, and linking item scores between the long and the Lite protocol overall as well as within the three main user groups: undergraduate students, graduate students and faculty. For the purposes of this study data from more than 10,000 library users from 14 institutions that implemented randomized control trials during the spring 2008, fall 2008, and spring 2009 survey cycles were analyzed.

Findings indicate that LibQUAL+® Lite is a viable and preferred alternative to the long form of 22 core items that has been established since 2003. LibQUAL+® Lite uses item sampling methods to: (a) gather data on all 22 LibQUAL+® core items, while (b) each individual participant

responds to only a subset of items. Every Lite user responds to one "linking" item from each of the subscales, and to a randomly-selected subset of five items from the remaining 19 (22-3) core LibQUAL+® items. As a consequence, survey response times are roughly cut in half, while the library still receives data on every survey question.

The matrix sampling method, the randomized control trial framework, and the statistical analysis methods outlined in the current study are useful heuristic methods for other high stakes library survey implementations whether for a physical as well as a digital library environment. These methodological approaches add rigor and thoughtful perspectives as they inform ways libraries shape their services and "touch" their users through improvements and innovations in the years to come.

To my parents

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CHAPTER 1. INTRODUCTION

LibQUAL+® is a suite of services that libraries use to solicit, track, understand, and act upon users' opinions of service quality. These services are offered to the library community by the Association of Research Libraries (ARL). The program's centerpiece is a rigorously tested Web-based survey that helps libraries assess and improve library services, change organizational culture, and market the library. Since 2000, more than 1,000 libraries have participated in LibQUAL+®, including college and university libraries, community college libraries, health sciences libraries, academic law libraries, and public libraries—some through various consortia, others as independent participants. LibQUAL+® has expanded internationally, with participating institutions in Africa, Asia, Australia, and Europe. LibQUAL+® is on the Web at <http://www.libqual.org/> where the goals of the program are articulated:

- Foster a culture of excellence in providing library service
- Help libraries better understand user perceptions of library service quality
- Collect and interpret library user feedback systematically over time
- Provide libraries with comparable assessment information from peer institutions
- Identify best practices in library service

- Enhance library staff members' analytical skills for interpreting and acting on data

LibQUAL+® was supported in part by a grant from the U.S. Department of Education's Fund for the Improvement of Postsecondary Education (FIPSE) from 2001 to 2003. It was initiated as a partnership between ARL and Texas A&M University Libraries under the leadership of Fred Heath, Dean of Libraries at Texas A&M at that time and currently Vice Provost at the University of Texas. Service quality measurement was considered a key area of investigation in 1999 under the ARL New Measures Initiative agenda spearheaded by Carla Stoffle, Dean of Libraries at the University of Arizona, and chair of the ARL Statistics and Measurement Committee at that time.

The core of the LibQUAL+® survey includes 22 survey items that measure overall service quality along three dimensions: (a) Affect of Service, (b) Information Control and (c) Library as Place:

(a) Affect of Service measures the interpersonal dimension of library service and includes aspects of empathy, responsiveness, assurance and reliability;

(b) Information Control measures service quality both from the perspective of content and access to information resources measuring the scope of the content offered by a library, convenience, ease of navigation, timeliness, equipment availability, and self-reliance; and,

(c) Library as Place measures how the physical environment is perceived both in pragmatic, utilitarian, and symbolic terms encompassing aspects of the library as a refuge.

The development of these concepts was based on iterative engagement of qualitative and quantitative research methods as documented in the literature review part in Chapter 2. LibQUAL+® builds upon extensive research that has taken place in the services marketing field emphasizing the gap model of measuring service quality that resulted in operationalizing service quality measurement through SERVQUAL.¹ SERVQUAL is the basis for the development of LibQUAL+®. In Colleen Cook's dissertation the SERVQUAL development and its relationship to the development of LibQUAL+® is thoroughly documented.² A brief history of the

¹ Valarie A. Zeithaml, A. Parasuraman, and Leonard L. Berry, *Delivering Quality Service: Balancing Customer Perceptions and Expectations* (New York: The Free Press, 1990).

² Colleen C. Cook, "A Mixed-Methods Approach to the Identification and Measurement of Academic Library Service Quality Constructs: LibQUAL+™" (PhD diss., Texas A&M University, 2001).

LibQUAL+® protocol has also been made available by Bruce Thompson.³

LibQUAL+® was developed in the academic library environment at a time that was ripe for wide adoption of the standardized service quality survey protocol across libraries using the web as the primary mode of administration. From the early days a number of methodological survey issues were investigated systematically. The proliferation of web surveys though places an extra burden on surveyors that need to make an extra effort "to distinguish their surveys from the countless other contacts ... one receives on a daily basis."⁴

LibQUAL+® has developed over the years a variety of customization features that allow the protocol to be standard yet tailored to many local needs and circumstances. The tension between standardization and local control has always been researched and managed carefully over the ten years of the development and

³ Bruce Thompson, *The Origins/Birth of LibQUAL+®* (Washington, DC: Association of Research Libraries, 2007), <http://www.libqual.org/> (accessed June 18, 2009).

⁴ Don A. Dillman, Jolene D. Smyth and Leah M. Christian, *Internet, Mail, and Mixed-mode Surveys: The Tailored Design Method* (Hoboken, NJ: Wiley, 2009), 9.

evolution of the protocol. For example, standardization of the survey items, through iterative and extensive application of reliability and validity analysis has always been a hallmark of the various LibQUAL+® implementations in different languages and different settings.

Local control has led to the development of customizable discipline categories that reflect the specific departmental or discipline offerings on each campus. The local categories are mapped to a standard set of disciplines that was formulated using the Table of Contents of the Classification of Instructional Programs by the National Center for Education Statistics. Variations across educational systems (US/North American and UK/European) have been accommodated over the years.

A customization option for adding five optional questions was also introduced. There was a large pool of items in the early iterations of the LibQUAL+® survey when item development was emphasized to identify the optimal dimensions of measuring library service quality. These test items had practical utility but they were not among the 22 core items that measure the three dimensions of library service quality (Affect of Service, Information Control,

and Library as Place) based on the validity and reliability iterative analysis results. The items that were not used as the 22 core questions together with items proposed by various consortia emphasizing aspects of interest to the consortium libraries were included in a list of more than 100+ optional items that libraries may choose from. A library may choose five questions or none according to the existing architecture of the survey. The optional items relate to the three dimensions at various levels of association. Research on the relation of these optional items to the LibQUAL+® dimensions has been published.⁵ In the article entitled "Using Localized Survey Items to Augment Standardized Benchmarking Measures: A LibQUAL+™ Study" libraries can identify optional items that are more similar or dissimilar to the three core dimensions. By studying these relations they can choose to include optional items either based on the desire to augment the study of the core dimensions, or to get information on other aspects of their services that do not relate closely to the core dimensions.

⁵ Bruce Thompson, Colleen Cook, and Martha Kyrillidou, "Using Localized Survey Items to Augment Standardized Benchmarking Measures: A LibQUAL+™ Study," *portal: Libraries and the Academy* 2 (2006): 219–230.

Securing representative data is an area that has received a lot of attention in the analysis of the LibQUAL+® data with every institutional results notebook including representativeness graphs for the local and the standard disciplines as well as the major population segments (undergraduate students, graduate students, and faculty). These graphs are charting the proportion of the respondents in comparison to the proportion of the population distribution for discipline, user group categories, and select demographic characteristics like sex.

Representativeness has been viewed as the key concept in ensuring useful data even though response rates may be low as is typical for web surveys. Typically about half of the people who view the survey tend to submit a complete version of the survey. This approximation of a 'response rate' does not exactly parallel controls we have in place for print surveys but it is a useful benchmark for most participating libraries.

Feedback through programmatic evaluation data received from libraries doing the survey indicates that it is hard to get the attention of survey respondents as populations become survey resistant, respondents often complain about the

redundancy of the survey questions, and respondent burden regarding the LibQUAL+® is high due to the atypical survey response format that measures three elements for each question: minimum expectations, desired expectations, and perceptions of service quality for the core 22 items. Libraries can tell whether services are meeting users' minimum expectations or exceed desired expectations. Understanding the strengths and areas where improvement is needed helps libraries address improvements in more effective ways. Libraries can allocate resources more wisely by focusing on areas where improvements are noticed by library users. Is it library as space that needs improvement? Is it more access to content? Or is it better staffing? The protocol can be a building block in strengthening library assessment activities. The need to test a shorter version of the protocol, LibQUAL+® Lite, that would yield useful data was the driving force behind the research described in this dissertation.

Statement of the Problem

The availability and maturity of the web for surveying users was a key factor in the success of the protocol. In the opening chapter of a seminal book on survey research, *Internet, mail and mixed-mode surveys: the tailored design*

method, Don A. Dillman, Jolene D. Smyth and Leah Melani Christian describe the changes survey methodology has undergone during the twentieth century. The header of their first chapter has the revealing title "Turbulent Times for Survey Methodology." In this chapter, they describe how characteristics like "human interaction, trust, time involvement with each respondent, and the locus of control has changed over time."⁶ The authors recognize the many appeals of web surveying⁷ while highlighting some of the challenges that have resulted in limiting surveying via the Internet to specific populations with high Internet access rates among them university students and faculty.⁸

It is increasingly difficult to secure good response rates to surveys as users are bombarded with information requests to fill in surveys for a variety of purposes. Especially young people like undergraduates or busy people like faculty are hard to tap on. Respondents also tend to complain about the repetitive nature and redundancy of the 22 items that measure the three basic dimensions, a redundancy useful for validity and reliability purposes.

⁶ Don A. Dillman, Jolene D. Smyth and Leah Melani Christian, *Internet, Mail, and Mixed-mode Surveys: the tailored design method* (Hoboken, New Jersey: Wiley, 2009), 2.

⁷ *Ibid.*, 8.

⁸ *Ibid.*, 9.

Minimizing the burden on respondents' time by reducing the number of items each respondent has to fill in while maintaining the integrity of the protocol in measuring the three dimensions of service quality in valid and reliable ways is an important improvement on the LibQUAL+® protocol.

The current research examines how the length of a questionnaire affects the way people respond to a web-based survey by implementing an experiment where respondents are randomly presented with the long or the Lite version of the LibQUAL+® survey. The study is based on the LibQUAL+® protocol that has been widely implemented across libraries over the years. As mentioned earlier, the core of the LibQUAL+® survey includes 22 survey items that measure overall service quality along three dimensions: (a) Affect of Service, (b) Information Control and (c) Library as Place. In designing the experiment it was important to develop a method where all three categories would be measured with a shorter survey form.

Purpose of the Study

The purpose of the study is twofold: (a) identifying whether item sampling using matrix sampling methods produced an improved version of the survey protocol for

institutions that participated in randomized trial experiments; in particular, improvements regarding participation rates, completion time for the survey, and results comparisons are expected to emerge in the Lite version of the protocol within different institutional settings; (b) identifying whether there are differences in the total, subscale, and linking item scores between the long and the Lite protocol overall as well as within the three main user groups: undergraduate students, graduate students and faculty. For the purposes of this study we are analyzing data from the spring 2008, fall 2008, and spring 2009 survey cycles from 14 libraries that participated in a series of randomized control trials. For convenience we refer to the spring 2008 data as the LibQUAL+® Pilot phase⁹ and the fall 2008 and spring 2009 data as the LibQUAL+® Beta phase.

Research Questions

The overarching research question relates to the design of a procedure for administering web-based questionnaires that can lead to improvements in this form of data collection to inform service improvement. In the library context, the

⁹ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example," *Performance Measurement and Metrics* 1 (2009): 6-16.

goal is to enable libraries to focus on input from their users by collecting systematically good information about their needs and wants, and improving services based on user feedback. In particular, we are examining whether respondent burden can be reduced, participation rates increased, and the quality of the information gathered improved when shortening survey length and employing matrix sampling in selecting questions for inclusion. The specific protocol tested for such improvements is the LibQUAL+(R) protocol which is rooted in the assessment work supported by the Association of Research Libraries. The overarching issues are addressed through a series of specific research questions as outlined below.

The LibQUAL+(R) protocol currently includes 22 core items measuring three subscales: (a) Affect of Service (9 items); (b) Information Control (8 items); and Library as Place (5 items). The LibQUAL+(R) Lite protocol collects data on all 22 ($9 + 8 + 5 = 22$) core items, but individual users each complete only eight items. Every Lite protocol user completes one "linking" item measuring each of the three subscales, plus five items randomly selected from the remaining 19 LibQUAL+(R) core items ($22 - 3 = 19$): (a) two items randomly selected from the eight nonlinking Affect of Service items;

(b) two items randomly selected from the seven nonlinking Information Control items; and (c) one item randomly selected from the four nonlinking Library as Place items.

The following six research questions are addressed in the study:

1. How much do participation rates differ between the long and the Lite version of the LibQUAL+® protocol?
2. How much do completion times differ between the long and the Lite version of the protocol?
3. Are the perception scores on the LibQUAL+® overall score, the three dimension scores (Affect of Service, Information Control and Library as Place), as well as the three linking items the same between the long and the Lite version of the protocol?
4. Are the scores on the total, subscale and linking item scores the same between the long and the Lite version of the protocol for each one of the participating libraries?
5. Are the scores on the overall, the three dimensions and the three linking items the same between the long and the Lite version of the protocol **within** each user group (undergraduates, graduate students, and faculty) across all participating institutions?

6. If there are score differences what are the adjustments we need to implement to convert scores from one version of the protocol to the other (long form scores to Lite ones and Lite form scores to the long form)?

Operational Definitions

Randomized control trials are considered the most reliable form of scientific evidence because they eliminate spurious causality and bias; they are important before approving changes, new procedures, or products. They are used to determine the effects of a "treatment" which can be small and hard to detect unless studied systematically on a large population. Evidence from multiple trials is important for replicability and reliability purposes.

Control group refers to the group that does not receive the treatment; in the case of the present study the control group is the group of libraries that filled in the long form which has been established as the regular standard LibQUAL+® survey form since 2003.

Triple-blind trial refers to the amount of structure in the randomization procedure connoting a level of security to prevent undue influence of the results. The randomized

control trials described in this study are triple-blind trials as all three key players, (a) participants, (b) researchers, and (c) the librarians who were coordinating the survey process, did not know who was receiving the “treatment” and who was in the control group.

Matrix sampling or item sampling is a method that involves developing a complete set of items judged to cover the measured concept, then dividing the items into subsets and administering to each subject one of the subsets of the items. Matrix sampling, by limiting the number of items administered to each subject, limits the amount of surveying or testing time required, while still providing, across subjects, coverage of a broad range of content.¹⁰

Randomized matrix sampling was implemented in the current study where items were randomly presented to each respondent from a larger pool for each of the subsets of items in the LibQUAL+® survey.

The Association of Research Libraries (ARL) is a nonprofit organization of 124 research libraries in North America.

¹⁰ Ruth A. Childs and Andrew P. Jaciw, “Matrix Sampling of Test Items: ERIC Digest” (October 2003), <http://www.ericdigests.org/2005-1/matrix.htm> (accessed June 13, 2009).

Its mission is to influence the changing environment of scholarly communication and the public policies that affect research libraries and the diverse communities they serve. ARL pursues this mission by advancing the goals of its member research libraries, providing leadership in public and information policy to the scholarly and higher education communities, fostering the exchange of ideas and expertise, and shaping a future environment that leverages its interests with those of allied organizations. ARL is on the Web at <http://www.arl.org/>.

Delimitation

Findings are transferable to libraries, and extended organizations, that have similar characteristics, user groups, and organizational cultures.

The randomized matrix sampling method for survey items is transferable to other local or standardized survey instruments. As a measurement strategy, the randomized matrix sampling method for survey items described in this study could be used in OTHER web surveys with more than a few questions to: (a) maximize response rates, (b) minimize burdens on respondents, and (c) ascertain whether results between Lite and long forms are comparable.

Importance of the Study

The randomized control trial, or experimental, method¹¹ with the application of matrix sampling techniques is a major breakthrough in library web-based survey methodological studies. As in most social sciences experimental methods are not easily designed for social conditions and often the analysis is based on correlation approaches. The introduction of the web though allows the design of experiments to find out how people interact with different aspects of the technological environment. Randomized control trials though rare in the field of library and information science are likely to increase in popularity among researchers in this field, as well as in other social science fields focusing on the interaction of people with technology, as studies like this one demonstrate the utility of the experimental method frameworks.

LibQUAL+® Lite is a survey methodology in which (a) ALL users answer a few, selected survey questions, but (b) the remaining survey questions are answered ONLY by a randomly-selected subsample of the users. Thus, **(a) data are collected on ALL QUESTIONS, but (b) each user answers FEWER**

¹¹ Scott E. Maxwell and Harold D. Delaney, *Designing Experiments and Analyzing Data: A Model Comparison Perspective* (Belmont, CA: Wadsworth Publishing Company, 1990).

QUESTIONS, thus shortening the required response time. In terms of the development of the LibQUAL+® protocol it is probably the most important research investigation over the last five years and the most significant improvement since the establishment of the protocol in 2003.

CHAPTER 2: LITERATURE REVIEW¹²

Introduction

A review of the research on the concept of library service quality since 1990 shows the rapid expansion and application of LibQUAL+® in academic libraries. LibQUAL+®, a rigorously tested protocol developed through a partnership between the Association of Research Libraries (ARL) and Texas A&M University Libraries, has been applied to more than 1,000 libraries since 2000. It is a thoroughly tested web-based survey heavily researched over the last decade.

This chapter examines applications of measuring library service quality using LibQUAL+® and places them within the context of the larger literature on service quality measurement. The chapter also offers a review of randomized control trials in relation to surveys and their length. Testing LibQUAL+® Lite is the main focus of this dissertation and the purpose is to ensure the equivalency of a Lite web survey form to the long version of the

¹² This literature review is based in part on Martha Kyriallidou, Colleen Cook, and S. Shyam Sunder Rao, "Measuring the Quality of Library Service through LibQUAL+," *Academic Library Research: Perspectives and Current Trends*, ed. Marie Radford and Pamela Snelson (Chicago: Association of College and Research Libraries, 2008), 253-301; The author has rights to modify, distribute, and publish for dissertation and other purposes.

protocol by exploring whether LibQUAL+® total and subscale scores across these two different survey forms are measuring the three core dimensions (Affect of Service, Information Control and Library as Place) in a comparable way.

Defining Service Quality

Business leaders define service quality as “the manner in which service is provided as it influences the degree of satisfaction with a good or service.”¹³ Service quality has roots in the total quality management (TQM) movement. In the library field “service quality is typically defined in terms of gap analysis, or the gap between customers’ expectations in general (for an ideal library and its services) and those perceptions relating to the particular library and its services.”¹⁴

The emphasis on improving services is tied closely with the notion of organizational performance. The Balanced

¹³ Robert W. Sexty, *Canadian Business in the New Stakeholder Economy* (Upper Saddle River, NJ: Prentice-Hall, 1998), 297.

¹⁴ Peter Herson and John R. Whitman, *Delivering Satisfaction and Service Quality: A Customer-Based Approach for Libraries* (Chicago: American Library Association, 2001), 15.

Scorecard¹⁵ (BSC) is another framework that examines the organization from four perspectives: User, Finance, Internal Processes, and Learning and the Future.¹⁶ The BSC provides another impetus for viewing organizational performance with a distinct emphasis on the user and the way the user experiences the quality of the services delivered. Both gap theory and the BSC have influenced the management of libraries in recent years and have shaped the ways in which libraries are describing and measuring organizational performance.

Library evaluation has a rich tradition, which Lancaster has documented extensively through the numerous studies undertaken for service-specific operations and specific functional-areas.¹⁷ Lancaster has attempted to offer a theoretical framework of evaluation that links evaluation to the five laws of Ranganathan: (1) books are for use, (2) every reader his book, (3) every book its reader, (4) save the time of the user, and (5) the library is a growing

¹⁵ Robert S. Kaplan and David P. Norton, "The Balanced Scorecard—Measures That Drive Performance," *Harvard Business Review* 70 (1992): 71–79.

¹⁶ Jim Self, "Using Data to Make Choices: The Balanced Scorecard at the University of Virginia Library," *ARL Bimonthly Report* 230/231 (October/December 2003): 28–29, <http://www.arl.org/newsltr/230/balscorecard.html>.

¹⁷ F. Wilfrid Lancaster, *If You Want to Evaluate Your Library* (Champaign: University of Illinois, Graduate School of Library and Information Science, 1988).

organism.¹⁸ Lancaster places these laws in the context of “guiding decisions on what should be evaluated, by what criteria, and by what method.”¹⁹ In many respects all five laws place a strong emphasis on the user approaches that have dominated the evaluation of library service quality since the 1990s.

Organizational Performance

Historically, libraries have measured their performance with the traditional input measures of collections, staffing, and expenditures.²⁰ Decades of descriptive data have been collected for academic and research libraries and published as the annual *ARL Statistics*²¹ and *Academic Library Trends and Statistics*.²² ARL has had a strong leadership in support of these efforts. It was a point of

¹⁸ F. W. Lancaster and Rashmi Mehrotra, “The Five Laws of Library Science as a Guide to the Evaluation of Library Services,” in *Perspectives in Library and Information Science*, ed. S. N. Agarwal, R. R. Khan, and N. R. Satyanarayana (Lucknow, India: Print House, 1982), 26-39.

¹⁹ F. Wilfrid Lancaster, *If You Want to Evaluate Your Library* (Champaign: University of Illinois, Graduate School of Library and Information Science, 1988), 11.

²⁰ Kendon Stubbs, “University Libraries, Standards and Statistics,” *College and Research Libraries* 42 (1981): 527–538; “Lies, Damned Lies, and ARL statistics?” *Research Libraries: Measurement, Management, Marketing: Minutes of the 108th Meeting of the Association of Research Libraries, Minneapolis, Minnesota*, (Washington, DC: Association of Research Libraries, 1986): 79–85; “Apples and Oranges and ARL Statistics,” *Journal of Academic Librarianship* 14 (September 1988): 231–235.

²¹ Association of Research Libraries, *ARL Statistics* (Washington, DC: Association of Research Libraries, annual).

²² Association of College and Research Libraries, *Academic Library Trends and Statistics* (Chicago: ALA/ACRL, annual). ACRL has used with permission the *ARL Statistics* instrument to survey all non-ARL academic libraries in the US and Canada.

pride for ARL Executive Directors and member leaders to assert that "ARL statistics represented the longest continual library statistical series in North America."²³

In the early 1980s, academic libraries began to place more emphasis on output measures and started collecting evidence on the number of service transactions, such as circulation and reference and interlibrary loans through the *ARL Statistics*. Researchers propose that the library can be described both in terms of input and output measures as augmented indicators of library quality and impact:²⁴

"Analysis of the ARL Statistics data set showed that there was a relationship between the ARL Index and descriptive service measures; between the number of undergraduate students and services; and between instructional presentations and operating expenditures."²⁵ Pritchard acknowledges that input and output metrics are limited: "The measurement of quality will come back to the questions of who are the users, what are the inputs, what are the outputs, do we produce the outputs in a way that meets the

²³ Brinley Franklin, "Duane Webster, Assessment Pioneer," *portal: Libraries and the Academy* 9, no. 3 (2009): 339.

²⁴ Sharon A. Weiner, "Library Quality and Impact: Is There a Relationship Between New Measures and Traditional Measures?" *Journal of Academic Librarianship* 31 (2005): 432–437.

²⁵ *Ibid.*, 432.

needs of the users, and what do those outputs contribute to the productivity and accomplishments of those users? The questions are not new, but the object we are measuring has changed in many dimensions.”²⁶ Fred Heath points out that in recent years the culture of assessment has reached its full maturity.²⁷

The concept of library service quality was appealing in the top administration circles as a driving force for reshaping library organizations. Libraries are tied to cultural and historical mandates that are rapidly changing with technological innovation and increased competition for scarce resources.²⁸ The need to stand as a symbol for knowledge and provide access to the knowledge gained by earlier generations still stands true but the means are changing from books to bytes. The challenge of managing the transition from a print based environment to an environment where information, and knowledge, is stored in convenient and easily accessible ways makes it necessary that libraries stay in close touch with user needs.

²⁶ Sarah Pritchard, “Determining Quality in Academic Libraries—Perspectives on Quality in Libraries,” *Library Trends* 44, no. 3 (Winter 1996): 572-594.

²⁷ Fred Heath, “A Salute to a Leader: ARL’s Assessment Protocol Initiatives,” *portal: Libraries and the Academy* 9, no 3 (2009): 336.

²⁸ Carla Stoffle, Robert Renaud, and Jerilyn Veldof, “Choosing our Futures,” *College and Research Libraries* 57 (1996): 213–225.

Library service quality captured the imagination of librarians by focusing squarely on the library user. A series of Online Computer Library Center (OCLC) reports were prepared to document the changing information-seeking user behavior patterns in a pragmatic wake-up call:

"College students are more aware of and use libraries' information resources more than other survey respondents. In addition, the more educated the respondents, the more they continue to use libraries after graduation. Awareness does not always translate into high usage. Overall, respondents have positive, if outdated, views of the 'library.' Younger respondents—teenagers and young adults—do not express positive associations as frequently."²⁹

Results from another similar study indicate that use of the library is highly related to the use of the Internet - information rich people tend to use the multiplicity of resources available to them.³⁰

²⁹ Online Computer Library Center, *Environmental Scan* (Dublin, OH: OCLC, 2003); *Information Format Trends* (Dublin, OH: OCLC, 2004); *Perceptions of Libraries* (Dublin, OH: OCLC, 2005), <http://www.oclc.org/reports/perceptionscollege.htm>; and *College Students' Perceptions*, (Dublin, OH: OCLC, 2005).

³⁰ Lee Rainie, Leigh Estabrook, and Evans Witt, *Information Searches That Solve Problems: How People Use the Internet, Libraries, and Government Agencies When They Need Help*. Pew Internet and American Life Project and the University of Illinois at Urbana-Champaign Graduate School of Library and Information Science (December 30, 2007), http://www.pewInternet.org/PPF/r/231/report_display.asp.

A landmark publication on *Measuring Academic Library Performance: A Practical Approach*³¹ emphasized user-based assessment by providing an evaluation framework widely adopted by many libraries that were engaging in local user-based assessment efforts. By the end of the 1990s, *Assessing Service Quality: Satisfying the Expectations of Library Customers*³² provided a thorough overview of the research and the theoretical and practical aspects of understanding service quality evaluation in libraries. Hernon and Altman's work summarizes the theoretical influence of leading researchers, Parasuraman, Zeithaml, and Berry in the services marketing field and synthesized the practical library studies that had their basis on the services marketing field.³³ Their work explicated the concept of the gap theory of service quality and the development of SERVQUAL. Complementary perspectives are also provided in Colleen Cook's dissertation where she

³¹ Nancy A. Van House, Beth Weil, and Charles R. McClure, *Measuring Academic Library Performance: A Practical Approach* (Chicago: ALA, 1990).

³² Peter Hernon and Ellen Altman, *Assessing Service Quality: Satisfying the Expectations of Library Customers* (Chicago: ALA, 1998).

³³ Valarie A. Zeithaml, A. Parasuraman, and Leonard L. Berry, *Delivering Quality Service: Balancing Customer Perceptions and Expectations* (New York: The Free Press, 1990).

advances the thinking by emphasizing that comparisons across libraries can be made.³⁴

SERVQUAL

Understanding the needs and psychology of current users is an important element for generating and using customer-based data for service improvements and for engaging in evidence-based decision making. *Quality* is ultimately something personal, subjective, and distinct for each person and is shaped by prior experiences, word of mouth, and personal interactions. In the services marketing field, the SERVQUAL tool was developed to measure the gap between customer expectations and perceptions in for-profit service industries. A conceptual model that was tested both in terms of (1) what is measured and (2) how it is measured provided a robust basis on which libraries could experiment. The SERVQUAL instrument measures the following five dimensions of service quality:

- tangibles - appearance of physical facilities, equipment, personnel, and communication materials

³⁴ Colleen C. Cook, "A Mixed-Methods Approach to the Identification and Measurement of Academic Library Service Quality Constructs: LibQUAL+™" (PhD diss., Texas A&M University, 2001), 78.

- reliability - ability to perform the promised service dependably and accurately
- responsiveness - willingness to help customers and provide prompt service
- assurance - knowledge and courtesy of employees and their ability to convey trust and confidence
- empathy - caring, individualized attention the firm provides its customers.³⁵

This framework was modified and tested in libraries across both the organizations and also in service-specific operations in single libraries. The basic SERVQUAL protocol is composed of twenty-two questions within the dimensions listed above. An important element of the SERVQUAL design is how these concepts are measured. In applying gap theory, or expectation confirmation-disconfirmation theory, the researchers developed and tested a variety of concepts and concluded that the best way to measure these concepts is in terms of both expectations and perceptions. Furthermore, there are two sets of expectations: minimum expectations and desired expectations. The area between minimum and desired expectations is the zone of tolerance. For the most

³⁵ Valarie A. Zeithaml, A. Parasuraman, and Leonard L. Berry, *Delivering Quality Service: Balancing Customer Perceptions and Expectations* (New York: The Free Press, 1990), 26.

part, the score on the organizational performance will fall within the zone of tolerance, though it is conceptually possible for performance to exceed desired expectations or fall below minimum expectations. The difference between perceptions and desired expectation is the service superiority gap, and the difference between perceptions and minimum expectations is the service adequacy gap.

The gap model in satisfaction assessment has been criticized from a number of different perspectives, which were briefly summarized by Roszkowski, Baky, and Jones:

- If after receiving the service a customer experiences a discrepancy between a desired and an actual level of service, future expectations will probably be revised to be closer to the actual (perceived) performance.
- When expectations are assessed after an experience has occurred, as is the case with the SERVQUAL and the LibQUAL+®, they are subject to contamination by the experience itself.
- Rarely do people rate the actual experience as higher than the desired level.
- Expectations are based on prior experiences with a particular service. People often have a difficult time formulating their expectations if they are novices to the given experience and may therefore assign an arbitrary or unrealistic rating to an expectation.

- There are statistical concerns with using a gap score because difference scores are notoriously unreliable.³⁶

Despite these limitations, library researchers have deployed gap theory successfully in assessing library services in an institution-wide perspective.³⁷ Other studies have explored whether disconfirmation theory can explain satisfaction formation processes in library users.³⁸ In one of these studies “both library users’ needs and expectations are investigated as disconfirmation standards. Overall library user satisfaction is predicted [and shown] to be a function of two independent sources: satisfaction with the information product received and satisfaction with the information system and library services used to retrieve the information product.”³⁹

Two thorough reviews of the service quality literature in libraries have been published by Nitecki, one in *Advances*

³⁶ Michael J. Roszkowski, John S. Baky, and David B. Jones, “So Which Score on the LibQUAL+ Tells Me if Library Users are Satisfied?” *Library and Information Science Research* 27 (2005): 427–428.

³⁷ Danuta A. Nitecki and Peter Herson, “Measuring Service Quality at Yale University’s Libraries,” *Journal of Academic Librarianship* 26 (2000): 259–273.

³⁸ Ruth Maddox Swan, “Perceived Performance and Disconfirmation of Expectations as Measures of Customer Satisfaction with Information Services in the Academic Library” (PhD diss., Florida State University, 1998).

³⁹ Xi Shi, Patricia J. Holahan, and M. Peter Jurkat, “Satisfaction Formation Processes in Library Users: Understanding Multisource Effects,” *Journal of Academic Librarianship* 30, no. 2 (2004): 122–131.

in *Librarianship* and another one in the *Encyclopedia of Library and Information Science*.⁴⁰ While these reviews Nitecki wrote focus on broad and theoretical aspects, the need to move beyond theoretical frameworks into implementing practical and effective measurements of user satisfaction has also been emphasized by her and Brinley Franklin. The latter paper was born out of the ARL library administrators' meeting convened by Carla Stoffle at the University of Arizona in Tuscon that sparked the ARL New Measures Initiatives agenda.⁴¹ Nitecki's more recent reviews attempt to examine service quality from a broader perspective, focusing on methods and models rather than quality of the services. This tack has been an effort to incorporate objective approaches and place them within a program evaluation framework.⁴²

User studies often evaluate both physical and electronic library services, and many address only electronic use. The Council on Library and Information Resources published two

⁴⁰ Danuta A. Nitecki, "Quality Assessment Measures in Libraries," in *Advances in Librarianship*, ed. F. C. Lynden (San Diego: Academic Press, 2001), 133–162; "Service Quality in Academic Libraries," in vol. 65 of *Encyclopedia of Library and Information Science*, ed. A. Kent (New York: Marcel Dekker, 1999), 216–232.

⁴¹ Danuta A. Nitecki and Brinley Franklin, "New Measures for Research Libraries," *Journal of Academic Librarianship* 25 (1999): 484–487.

⁴² Danuta A. Nitecki, "Program Evaluation in Libraries: Relating Operations and Clients," *Archival Science* 4 (2004): 17–44.

such review studies. A review by Troll focused on issues related to usage and usability assessment.⁴³ A year later another review by Tenopir covered more than 200 studies. As part of Tenopir's synthesis, the following insights on user behavior with electronic resources are confirmed:

- Both faculty and students use and like electronic resources and most readily adopt them if the sources are perceived as convenient, relevant, and time saving to their natural workflow.
- Experts in different subject disciplines (work fields) have different usage patterns and preferences for print or electronic. There is no one right solution for services or system design for every subject discipline.
- Print is still used for some reading and is part of research in almost every discipline. It is considered important in certain disciplines, especially in the humanities.
- Print remains the most popular medium for books; e-book use is still in the very early stages.
- Most e-journal users still print out articles that are judged useful—so a printing format such as PDF is popular.
- Subject experts use hyperlinks to view related articles; students' use of hyperlinks is less clear.
- Browsing a small number of core journals is important (in print or electronic forms), especially for subject experts and for current awareness searching.
- Searching by topic in an article database is important for all other purposes.
- Users will read articles from a wide variety of journal titles and sources if available to them, although most of the readings come from relatively few journals.
- Personal subscriptions to journals continue to decrease, so users rely more on electronic subscriptions subsidized by the library and on the Internet.

⁴³ Denise Troll, *Usage and Usability Assessment: Library Practices and Concerns* (Washington, DC: Council on Library and Information Resources, 2002).

- Most journal article readings are of articles within their first year of publication, but a sizeable minority of readings come from materials that are older than one year.
- College and high school students use the Internet more than the library for research, and many believe they are more expert at searching than their teachers.
- Students exercise some quality judgments about materials they retrieve from the Internet, but those quality judgments may not exactly match faculty members' criteria for quality.⁴⁴

A thorough review of the SERVQUAL literature was published by Heath and Cook in the *Encyclopedia of Library and Information Science*⁴⁵ with an explanation of the elements that LibQUAL+® used from the gap theory model. Their review describes the influence of the services marketing field literature and SERVQUAL on the library field. The services marketing field has a strong influence on a unique stream of studies within the library field, many of them deriving from the LibQUAL+® branching of the literature stream and its related implementations.

⁴⁴ Carol Tenopir, *Use and Users of Electronic Library Resources* (Washington, DC: Council on Library and Information Resources, 2003), iv-v, <http://www.clir.org/PUBS/reports/pub120/pub120.pdf> (accessed September 27, 2009).

⁴⁵ Fred Heath and Colleen Cook, "SERVQUAL: Service Quality Assessment in Libraries," in vol. 4 of *Encyclopedia of Library and Information Science*, 2nd ed., ed. M. A. Drake (New York: Marcel Dekker, 2003), 2613–2625.

ARL Symposium on Measuring Library Service Quality

The measurement of service quality was the main theme of a symposium organized by ARL in 2000, inviting experts from all over the world. The papers from that symposium were published as a special issue of *Library Trends*.⁴⁶ One of the recurrent themes in the library literature of the 1990s is the validation of dimensions measured by SERVQUAL. Calvert conducted a cross-cultural study across China and New Zealand and reported that three common dimensions surfaced between these widely divergent populations: (1) access to collections, (2) the reliability and trustworthiness of services, and (3) physical space.⁴⁷ Calvert's dimensions were an early evocation of the three dimensions LibQUAL+® ultimately measured in 2003.

Issues related to the differences between the concepts of satisfaction and service quality also were explored in the articles presented at the ARL symposium.⁴⁸ For some survey researchers the difference between satisfaction and service

⁴⁶ Martha Kyriellidou and Fred M. Heath, "Measuring Service Quality: Introduction," *Library Trends* 49 (2001): 541–547.

⁴⁷ Philip J. Calvert, "International Variations in Measuring Customer Expectations," *Library Trends* 49 (2001): 732–757.

⁴⁸ Danuta A. Nitecki and Peter Herson, "Measuring Service Quality at Yale University's Libraries," *Journal of Academic Librarianship* 26 (2000): 259–273; Rowena Cullen, "Perspectives on User Satisfaction Surveys," *Library Trends* 49 (2001): 662–686.

quality is hair-splitting and inconsequential. Others place stronger emphasis on the distinction between the immediate affective aspects of satisfaction and the more cognitive and long-term aspects of service quality expectations and perceptions. The relationship between affective states and actual behavioral aspects was also studied by researchers, indicating that the use of libraries relates to positive affect.⁴⁹ In other words, people who have positive feelings about the library tend to demonstrate behavioral traits like using the library more often and, one may conjecture that this also results in increased positive outcomes like higher achievement, better grades, increased knowledge and ability to fulfill professional, personal and recreational needs.

In examining the performance measurement approaches used in Europe, two reports were presented at the ARL symposium on measuring library service quality. One of the reports focused on practices in the UK and the other one explored practices in Germany. Issues of satisfaction and service quality measurement have a strong research and empirical base in the UK, as UK higher education institutions have

⁴⁹ Patience L. Simmonds and Syed S. Andaleeb, "Usage of Academic Libraries: The Role of Service Quality, Resources, and User Characteristics," *Library Trends* 49 (2001): 626–634.

become more involved in the quality audit processes established for academic institutions.⁵⁰ Research reporting the state of affairs in Germany indicated a stronger emphasis on objective and descriptive measures of library performance focusing on efficiency aspects rather than the more psychologically “soft” aspects of user satisfaction and service quality expectations.⁵¹

An early groundbreaking qualitative study reporting the results of the interviews that grounded the LibQUAL+® instrument was also published in the 2001 special issue of *Library Trends*.⁵² In parallel, a thorough quantitative study reported the results of the dimensionality of the first LibQUAL+® implementation (Figure 1) across the initial cohort of a dozen ARL libraries that implemented LibQUAL+®.⁵³ These two pieces were the first two articles reporting a thorough iterative process and interplay

⁵⁰ Ian Winkworth, “Innovative United Kingdom Approaches to Measuring Service Quality,” *Library Trends* 49 (2001): 718–731.

⁵¹ Roswitha Poll, “Performance, Processes, and Costs: Managing Service Quality with the Balanced Scorecard,” *Library Trends* 49 (2001): 709–717.

⁵² Colleen Cook and Fred M. Heath, “Users’ Perceptions of Library Service Quality: A LibQUAL+™ Qualitative Study,” *Library Trends* 49 (2001): 548–584.

⁵³ Colleen Cook and Bruce Thompson, “Psychometric Properties of Scores from the Web-Based LibQUAL+ Study of Perceptions of Library Service Quality,” *Library Trends* 49 (2001): 585–604.

between qualitative and quantitative methods in the development and refinement of LibQUAL+® (Figure 2).

Two of the libraries implementing LibQUAL+® during the initial formative years of 2000–2001, University of Arizona and University of Washington, also reported on their local organizational models and methods regarding user satisfaction measurement and how the local efforts complemented the total market survey perspective that LibQUAL+® was establishing.⁵⁴ From the very beginning the point that LibQUAL+® is **one measure among many tools** and methods that libraries need to deploy was established by the practitioners in the early cohort.

LibQUAL+® is one of eleven ways of listening to users, called a *total market survey*. As Berry explained, “When well-designed and executed total market surveys provide a range of information unmatched by any other method... A critical facet of total market surveys (and the reason for using the word *total*) is the measurement of competitors’ service quality. This [also] requires using non-customers

⁵⁴ Shelley Phipps, “Beyond Measuring Service Quality: Learning from the Voices of the Customers, the Staff, the Processes, and the Organization,” *Library Trends* 49 (2001): 635–661; and Steve Hiller, “Assessing User Needs, Satisfaction, and Library Performance at the University of Washington Libraries,” *Library Trends* 49 (2001): 605–625.

in the sample to rate the service of their suppliers.” Although (1) measuring perceptions of both users and non-users and (2) collecting perceptions data with regard to peer institutions can provide important insights, Berry recommended using multiple listening methods and emphasized that “ongoing data collection ... is a necessity. Transactional surveys, total market surveys, and employee research should always be included.”⁵⁵

Introducing LibQUAL+®

The ground was fertile for building the rich literature of the 1990s on library service quality.⁵⁶ ARL and Texas A&M University Libraries collaborated in developing LibQUAL+® as a total market survey for measuring library service quality in the ARL “New Measures” toolkit.⁵⁷ LibQUAL+®, a practical application with an extensive research base, has been applied to more than 1,000 libraries—primarily college and university libraries—since 2000. LibQUAL+® initiated at least three kinds of partnerships: one between

⁵⁵ Leonard L. Berry, *On Great Service: A Framework for Action* (New York: The Free Press, 1995), 37, 54.

⁵⁶ Martha Kyrillidou and Kaylyn Hipps, “Symposium on Measuring Library Service Quality,” *ARL Bimonthly Report* 215 (April 2001): 9–11, <http://www.arl.org/newsltr/215/octsymp.html>; and Martha Kyrillidou and Fred M. Heath, “Measuring Service Quality: Introduction,” *Library Trends* 49 (2001): 541–547.

⁵⁷ Julia C. Blixrud, “Mainstreaming New Measures,” *ARL Bimonthly Report* 230/231 (October/December 2003): 1–8, <http://www.arl.org/bm~doc/mainstreaming.pdf> (accessed October 24, 2009)

ARL and Texas A&M, a second among all the participating libraries and their staffs, and a third among the hundreds of thousands of users who have provided their valuable feedback over the years.⁵⁸

Has library service quality improved as a result of this work over the last two decades? As with every evaluative question, the operative question is "compared to what?" The major trends and impact of LibQUAL+® are presented here through a review of related scholarly research. There are two basic types of articles documenting the emergence of LibQUAL+® over the recent past: (1) the peer-reviewed scholarly articles and (2) the articles documenting the practical ways that libraries have used LibQUAL+® to make service improvements. In addition to these two sets of published literature, there is a third type of literature—the Web-based gray. More than 1,000 libraries have implemented LibQUAL+®, many of them multiple times. As these libraries disseminate their assessment efforts and document their organizational commitments for service improvement, numerous reports are available through the library Web sites.

⁵⁸ Colleen C. Cook, "A Mixed-Methods Approach to the Identification and Measurement of Academic Library Service Quality Constructs: LibQUAL+™" (PhD diss., Texas A&M University, 2001).

Early years

In collaboration with ARL and under the administrative leadership of Fred Heath and Colleen Cook at Texas A&M University LibQUAL+® was created.⁵⁹ LibQUAL+® was initiated in 2000 as an experimental project of benchmarking perceptions of library service quality across thirteen ARL libraries. Both quantitative and qualitative methods were applied rigorously in an iterative fashion. This iterative approach resulted in a rich record of published articles documenting both the qualitative and the quantitative research cycles.⁶⁰

⁵⁹ Earlier efforts to implement a similar project within ARL date back to 1996 when Danuta Nitecki in collaboration with Martha Kyrillidou at ARL approached the Council on Library Resources with a grant proposal to apply SERVQUAL to a group of six ARL libraries (see agenda and minutes from the ARL Committee on Statistics and Measurement, October 16, 1996, 128th ARL Membership Meeting, Washington, DC). The model proposed at that time was a service-specific evaluation model similar to the one implemented in Nitecki's award-winning dissertation. That effort was not successful in securing funding at that time and the environment among ARL libraries was not as receptive as it was four years later when Fred Heath and Colleen Cook proposed the idea among ARL directors. By 2000 there was a strong culture and receptivity for experimentation among ARL libraries following the development of the New Measures agenda in 1999 as supported by Carla Stoffle, chair of the ARL Statistics and Measurement Committee at that time. The model proposed by Fred Heath was a total market survey encompassing the whole organization rather than specific services and departments within the organization. Fred Heath's approach was useful for the management of a large research library like Texas A&M, and he regularly implemented such surveys throughout the 1990s. By 2000 there was a strong need to bring this effort forward to a larger community for comparison purposes across institutions. ARL was the ideal community for this effort to take strong roots because of the long-standing tradition of collecting, sharing, and using data effectively across institutions. Yet Heath's foresight, political instincts, and vision in bringing this effort forward at the right time and to the right community should not be underestimated as it has formed the basis for the unprecedented success of the LibQUAL+® protocol.

⁶⁰ Colleen Cook and Fred M. Heath, "Users' Perceptions of Library Service Quality: A LibQUAL+™ Qualitative Study," *Library Trends* 49 (2001): 548–584; Colleen Cook and Bruce Thompson, "Psychometric Properties of Scores from the Web-Based LibQUAL+ Study of Perceptions of Library Service Quality," *Library Trends* 49 (2001): 585–604; Colleen Cook, Fred Heath, and Bruce Thompson, "Users' Hierarchical Perspectives on Library Service Quality: A 'LibQUAL' Study," *College and Research Libraries* 62 (2001): 147-154; Colleen Cook, Fred Heath, Bruce Thompson, and R. L. Thompson, "LibQUAL+™: Service Quality Assessment in Research Libraries," *IFLA Journal* 4 (2001): 264–268; C.

Spurred by funding from the Fund for the Improvement of Post-Secondary Education (FIPSE), LibQUAL+® grew rapidly and by 2002, the LibQUAL+® Web-based protocol was completed by 20,416 participants representing forty-three universities. A study examining the reliability of these scores and the dimensions underlying user perception showed that a more parsimonious protocol with fewer survey questions could measure library service quality reliably along four basic dimensions of library service quality: *Affect of Service, Personal Control, Access to Information, and Library as Place*. These dimensions were addressing effectively the lack of fit of the traditional SERVQUAL protocol for the library sector.

Cook, F. Heath, B. Thompson, and Russell L. Thompson, "The Search for New Measures: The ARL LibQUAL+ Study—A Preliminary Report," *portal: Libraries and the Academy* 1 (2001):103–112; Bruce Thompson, Colleen Cook, and Fred Heath, "How Many Dimensions Does It Take To Measure Users' Perceptions of Libraries?: A LibQUAL+ Study," *portal: Libraries and the Academy* 1 (2001): 129–138; Bruce Thompson and Colleen Cook, "Stability of the Reliability of LibQUAL+™ Scores: A 'Reliability Generalization' Meta-Analysis Study," *Educational and Psychological Measurement* 62 (2002): 735–743; Bruce Thompson, Colleen Cook, and Fred Heath, "Structure of Perceptions of Service Quality in Libraries: A LibQUAL+™ Study," *Structural Equation Modeling* 10 (2003): 456–464; Youhua Wei, Bruce Thompson, and Colleen Cook, "Scaling Users' Perceptions of Library Service Quality Using Item Response Theory: A LibQUAL+™ Study," *Libraries and the Academy* 5 (2005): 93–104; Yvonna Lincoln, "Insights into Library Services and Users from Qualitative Research," *Library and Information Science Research* 24 (1) (2002): 3-16.

In addition to establishing the key dimensions of library service quality, the study demonstrated a number of other benefits:

Large collections do not, in and of themselves, insure that library users always have positive service experiences. Thus, librarians interested in improving service quality need tools to help them benchmark current user perceptions, identify needed areas of improvement, and locate peer institutions obtaining more favorable outcomes. ...LibQUAL+® satisfies the major reasons for conducting total market surveys. First, non-local information can reveal how well other libraries perform services and can provide a basis for comparison. Secondly, exemplary libraries can be identified as models for service improvement planning. Finally, total market surveys permit performance tracking over time. Systematic listening to users improves decision making in allocation of scarce resources.⁶¹

Additional research based on 20,416 respondents across forty-three universities showed that score norms could be developed, and such norm tables could help libraries interpret their scores with respect to typical profiles at other universities. Norms were developed for both *perceived* service scores and *gap* scores (e.g., perceived performance minus minimally acceptable performance). Norms such as these assist library managers in decision making by identifying (1) specific areas for needed improvement, (2) specific areas of needed additional service quality

⁶¹ Bruce Thompson, Colleen Cook, and Russell L. Thompson, "Reliability and Structure of LibQUAL+™ Scores: Measuring Perceived Library Service Quality," *portal: Libraries and the Academy* 2 (2002): 3–12.

information (e.g., focus groups), and (3) peer institutions from which superior service practices can be modeled.⁶²

Recent research on the stability of the norms has shown that LibQUAL+® norms are remarkably stable across cohorts and time so libraries that compare their institutional scores against group scores should be relatively certain that they are using a robust baseline.⁶³

LibQUAL+® data was further mined to answer the following questions:

1. How well do LibQUAL+® subscale (i.e., Service Affect, Library as Place, Personal Control, and Information Access) and total scores correlate with external validity scores (e.g., user ratings of service and satisfaction)?
2. Which of the 25 LibQUAL+® item scores most differentiate the forty-three institutional affiliations of the 20,416 study participants?
3. Do mean ratings of perceived library service quality, as measured by LibQUAL+® T-scores, differ with frequency of library use?
4. Do mean ratings of perceived library service quality, as measured by LibQUAL+® total T scores, differ across user types (e.g., faculty members, graduate students)?
5. To what extent are institutional mean LibQUAL+® subscale and total scores correlated with ARL

⁶² Colleen Cook, Fred Heath, and Bruce Thompson, "Score Norms for Improving Library Service Quality: A LibQUAL+™ Study," *portal: Libraries and the Academy* 2 (2002): 13–26.

⁶³ Bruce Thompson, Colleen Cook, and Martha Kyrillidou, "Stability of Library Service Quality Benchmarking Norms across Time and Cohorts: A LibQUAL+™ Study" (paper presented at the Asia-Pacific Conference of Library and Information Education and Practice [A-LIEP], Singapore, April 4–7, 2005). <http://www.coe.tamu.edu/~bthompson/libq2005.htm#1>.

Membership Criteria Index scores of the thirty-five participating libraries belonging to ARL?⁶⁴

It was found that LibQUAL+® subscale and total scores correlated highly with satisfaction scores in two independent sub samples. As expected, respondents who reported they were never using the library systematically rated services lower than did other users. Also as expected, LibQUAL+® mean scores—intended primarily to measure perceived service quality—correlated less with institutional ARL Index scores. The relation of institutional characteristics and scores of service quality were explored in groups of libraries beyond the ARL member libraries.⁶⁵ Service quality indices, especially as measured by the service affect dimension, appear to have a slightly inverse relation to collection investments reflecting the higher expectations and harder-to-meet demands of the research library user. These findings are also confirmed in Miller's dissertation where she analyzed data from 159 colleges and universities from the 2006 LibQUAL+®

⁶⁴ Fred Heath, Colleen Cook, Martha Kyrillidou, and Bruce Thompson, "ARL Index and Other Validity Correlates of LibQUAL+™ Scores," *portal: Libraries and the Academy* 2 (2002): 27–42.

⁶⁵ Martha Kyrillidou and Fred M. Heath, "The Starving Research Library User: Relationships Between Library Institutional Characteristics and Spring 2002 LibQUAL+™ Scores," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 1-11. Co-published simultaneously in *Journal of Library Administration* 40 (2004): 1–11.

implementation.⁶⁶ Miller is recommending replication of the study in different subgroups and in combination with qualitative data (i.e. analysis of comments).

As a result of the iterative approach of applying qualitative and quantitative methods, the LibQUAL+® dimensions have been crystallized in measuring three essential aspects of library service quality: *Affect of Service, Library as Place, and Information Control* (Figure 3) after the 2003 LibQUAL+® implementation. That year, among the 300 participating libraries, a group of UK institutions joined the project;⁶⁷ a comparison was conducted between LibQUAL+® and other protocols used in the UK, such as the SCONUL Template for User Satisfaction Surveys and the Priority Research analysis service. Reliability and validity analysis of the UK results also show that the program provides useful evidence for improving service quality in that context. Furthermore, this study affirmed that the Access to Information and

⁶⁶ Kathleen Miller, "Service Quality in Academic Libraries: An Analysis of LibQUAL+™ Scores and Institutional Characteristics" (Ed.D. diss., University of Central Florida, Spring 2008).

⁶⁷ J. Stephen Town, "Filling the Void or Bridging the Deep? LibQUAL + in the UK," in *Proceedings of the 5th Northumbria International Conference on Performance Measurement in Libraries and Information Services*, Durham, UK, July 28–31, 2003, ed. Sandra Parker (Bradford, UK: Emerald, 2004), http://www.libqual.org/documents/admin/Town-Filling_the_void.doc.

Personal Control dimensions are collapsed into an Information Control dimension. Users increasingly fail to distinguish between content (Access to Information) and access mechanisms (Personal Control).

These findings were confirmed by the results of the French language experience of applying LibQUAL+® in the French Canadian environment.⁶⁸ The question of whether the French translation produced scores equivalent to the English versions of the instrument (British and American English) was answered affirmatively. The process of validation provided confidence that the versions of the instrument are culturally relevant in the target language and conceptually equivalent to the original. The three dimensions of library service quality were firmly established in a variety of diverse contexts.

International impact

The protocol has since continued to expand internationally, followed with careful context-sensitive studies that inform

⁶⁸ Martha Kyrillidou, Toni Olshen, Fred Heath, Claude Bonnelly, and Jean-Pierre Côte, "Cross-Cultural Implementation of LibQUAL+™: The French Language Experience" *Proceedings of the 5th Northumbria International Conference on Performance Measurement in Libraries and Information Services*, 193-199 (Bradford, UK: Emerald, 2004); and Colleen Cook, Fred Heath, and Bruce Thompson, "LibQUAL+(TM) from the UK Perspective" *Proceedings of the 5th Northumbria International Conference on Performance Measurement in Libraries and Information Services*, 156-159 (Bradford, UK: Emerald, 2004).

its applicability to new environments. For example, Kyrillidou and Persson documented issues related to a Swedish implementation.⁶⁹ By 2009, the protocol was translated in 17 different languages and used in 19 different countries. Research regarding LibQUAL+® has appeared in many different languages describing aspects of the implementation and the lessons learned in new environments as well as relating the Anglo-American experience to non English speaking audiences.⁷⁰

Parallel to the LibQUAL+® related efforts, there are occasional independent studies in the same general stream of research like the one conducted among scholars in Finland, Japan, United Kingdom, and Thailand, that has very

⁶⁹ Martha Kyrillidou and Ann-Christin Persson, "The New Library User in Sweden: A LibQUAL+™ Study at Lund University," *Performance Measurement and Metrics* 1 (2006): 45–53.

⁷⁰ Ann-Christin Persson, "LibQUAL+ synliggör den vilde användaren," *InfoTrend* 60 (2005): 46-53; Martha Kyrillidou, Toni Olshen, Fred Heath, Claude Bonnelly, and Jean-Pierre Côte, "La mise en œuvre interculturelle de LibQUAL+(MC) Le cas du français," *BBF 2005 Paris, t.50, no 05*: 48-55; Ann-Christin Persson, "Mätning av tjänstekvalitet i bibliotek: användning av LibQUAL+(TM) i Sverige," ("Measuring service quality in libraries: the use of LibQUAL+™ in Sweden") (Master's thesis, University College of Borås, 2005); Eva Alopaeus and Britt Omstedt, "Jag har kommit hit för att låna böcker, inte för att bli ompysslad Försök med LibQual+™ vid två svenska bibliotek," *INFOtrend: Nordic Journal for Information Specialists* 60 (2005): 39-45; Jos Smelik, "Een ander gebruikersonderzoek," *Informatie Professional* 8 (2004): 28-31; Rosa Tello Santos, *Propuesta de evaluación del servicio de la Sala de Referencia de la Biblioteca Central Pedro Zulen de la UNMSM : experiencia piloto con LibQUAL+ de la Association of Research Libraries* (Lima, Peru, 2004); Maria I. C. Sampaio et al., *PAQ – Programa de avaliação da qualidade de produtos e serviços de informação: uma experiência no SIBi/USP. Ci. Inf., Brasília* 33 (2004): 142-148 (written by a research team in Brazil in Portuguese); Pehlke Rainer, "LibQUAL+: Ein Instrument zur Messung der Servicequalität in Bibliotheken," *BuB-Journal* 54 (2002): 654-657; Colleen Cook, Fred Heath, and Bruce Thompson, "A New Culture of Assessment: Preliminary Report on the ARL SERVQUAL Study," 66th IFLA Council and General Conference in Jerusalem, Israel, August 13-18, 2000, <http://www.ifla.org/IV/ifla66/papers/028-129e.htm>; in French, <http://www.ifla.org/IV/ifla66/papers/028-129f.htm>; in Russian, <http://www.ifla.org/IV/ifla66/papers/028-129r.pdf>; in Spanish, <http://www.ifla.org/IV/ifla66/papers/028-129s.htm>; in German, <http://www.ifla.org/IV/ifla66/papers/028-129g.htm>.

similar findings in terms of the dimensionality of the service quality construct measured.⁷¹ The study in Thailand was influenced by earlier studies conducted in Japan by Haruki Nagata and published in Japanese.⁷² An independent study influenced by LibQUAL+® was also done in Peru and published in Spanish in a local professional journal.⁷³ Another recent independent study, the first in a public university in Bangladesh using SERVQUAL identified similar dimensions named: affect of service (organizational), collection and access, library as a place, and affect of service (personal).⁷⁴ There has even been a study in Iran that used a modified local version of the LibQUAL+® survey to study subgroup analysis by gender!⁷⁵ All these independent studies confirm the concept of universality of library service quality at a level that goes beyond

⁷¹ Narit Nimsomboon and Haruki Nagata, “Assessment of Library Service Quality at Thammasat University Library System,” August 2003, http://www.libqual.org/documents/admin/nagata_report0403.pdf (accessed September 30, 2009).

⁷² Haruki Nagata, M. Fujii, and A. Kitamura, *Measuring Library Service Quality by SERVQUAL* (Tokyo: Daigaku Toshokan Kenkyu, No. 59, (2000): 1-15; Y. Satoh and Haruki Nagata, “The Assessment of Library Service Quality: Principally on the Issues for Applying SERVQUAL to Library Services,” *Journal of Japan Society of Library and Information Science* (in Japanese) 49, no.1, (2003): 1-14.

⁷³ Roxana Huamán Huriarte, Karen Alfaro Mendives, and Carlos Vilchez Román, “Evaluación de la calidad del servicio de una biblioteca universitaria: La experiencia del LibQUAL+ en cinco facultades de la Universidad Nacional Mayor de San Marcos”, *Biblios* 31 (Abr- Jun. 2008): 1-13.

⁷⁴ S.M. Zabed Ahmed and M. Zahid Hossain Shoeb, “Measuring Service Quality of a Public University Library in Bangladesh Using SERVQUAL,” *Performance Measurement and Metrics* 10, no.1 (2009): 17-32.

⁷⁵ Nadjla Hariri and Farideh Afnani, “LibQUAL+® in Iran: A Subgroup Analysis by Gender,” *Performance Measurement and Metrics* 9, no.2 (2008): 80-93.

boundaries of cultures, languages, and institutions. There is a universality of the library concept of service quality with global dimensions that are captured effectively in the emerging professional literature covering academic libraries.⁷⁶

At the same time the epistemological foundations are being revisited in new cultural settings as the following study in China attempts to do: "The study shows that the actual SERVQUAL score is distributed in a very scattered manner in all three libraries, and that it is formed through a very complex process rooted primarily in the user's personal experiences with the library, which are in turn shaped by factors from both the library world and the user's life-world. Based on these findings, this research questions a number of SERVQUAL assumptions and proposes three concepts which may help to contextualize the SERVQUAL score and enhance its utility in actual library assessment: library planning based variance of user perception, perception-dependent user expectation and library-sophistication based user differentiation."⁷⁷

⁷⁶ Susan McKnight, "Are There Common Academic Library Customer Values?" *Library Management* 19, no.6/7 (2008): 600-619.

⁷⁷ L. Yu, Q. Hong, S. Gu, and Y. Wang, "An Epistemological Critique of Gap Theory Based on Library Assessment: The Case of SERVQUAL," *Journal of Documentation* 64, no. 4 (2008): 511-551.

Beyond academic libraries

In addition to the typical comprehensive university library implementation, the survey has been adapted by academic health science libraries, hospital libraries in the US and in the UK. The reliability of the scores was explored in these three settings -- across hospital libraries in the UK, in the US and academic health science libraries in the US. The findings revealed that the scores have high reliability coefficients in all these different settings.⁷⁸ Service quality research has a long tradition in health library and information services settings that are increasingly concerned with measuring value and impact.⁷⁹

An independent study in public libraries in Canada explores the relationship between perceived service quality, perceived value and related recommendations. "The results show that affect of service, library as place, and information control significantly explain perceived value. There is a strong relationship between perceived service

⁷⁸ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "User Library Service Expectations in Health Science vs. Other Settings: A LibQUAL+® Study," *Health Information and Libraries Journal* 24, Suppl. 1 (2007): 38-45.

⁷⁹ Joanne G. Marshall, "Measuring the Value and Impact of Health Library and Information Services: Past Reflections, Future Possibilities," *Health Information and Libraries Journal* 24, Suppl. 1 (2007): 4-17.

value and recommendation. The results also support the validity of the LibQUAL+™ measure used in this study and its relevance in the public library service context.”⁸⁰

A set of important questions in the protocol ask about use of (a) library premises, (b) library website, and (c) use of search engines like Google. The data have consistently showed the increasing dominance of Google and other search engines since 2000. During the 2006 library conference in Bielefeld, Anurag Acharya, Principal Engineer at Google Inc. and developer of Google Scholar, used LibQUAL+® data to demonstrate how often search engines like Google are used.

A detailed analysis of three years of data looked closely at the on premises versus Google-like information gateway usage patterns. Using LibQUAL+® data provided by 295,355 of the participants who completed the LibQUAL+® survey in 2003, 2004, and 2005, three research questions were addressed. First, what differences, if any, have occurred across time in the use by (a) undergraduates, (b) graduate students/postgraduates, and (c) faculty of on-premises

⁸⁰ Riadh Ladhari and Miguel Morales, “Perceived Service Quality, Perceived Value and Recommendation: A Study Among Canadian Public Library Users,” *Library Management* 29, no. 4/5 (2008): 352.

library information resources versus non-library information gateways such as Google? Second, what differences, if any, have occurred across international regions in the use by (a) undergraduates, (b) graduate students/postgraduates, and (c) faculty of on-premises library information resources versus non-library information gateways such as Google? Third, what differences, if any, are there in perceptions of library service quality across four user types ("Nonusers," "Traditionalists," "Web Techies," and "Voracious Users") reflecting different on-premises and Internet gateway usage frequencies? The results shed light on information use trends and patterns around the world and show the increasing similarities of our global users. Undergraduates use library spaces, faculty use electronic resources and graduate students tend to resemble more the faculty use patterns.⁸¹

Not simply a tool

As a protocol for evaluating libraries, LibQUAL+® could not exist in the pre-Web world. The timing of its development coincided with the widespread emergence and adoption of the

⁸¹ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "On-Premises Library Versus Google-Like Information Gateway Usage Patterns: A LibQUAL+® Study," *portal: Libraries and the Academy* 7, no. 4 (2007): 463-480.

Internet. The tools that make Google possible make the need for LibQUAL+® imperative. Libraries need to know what their users think, to understand how it compares with the thinking of users in other libraries—not only within their own institution but beyond.⁸² LibQUAL+® is a grounded protocol which includes a standard set of items.

Librarians have compared LibQUAL+® with popular off-the-shelf web survey tools like Survey Monkey though these comparisons are ignoring the fact that LibQUAL+® is more than simply a tool for distributing different survey protocols - it is a well defined protocol. LibQUAL+® is appropriate for those who want a standard solution with general questions that apply across institutions and allows benchmarking across different settings. For local survey development, tools like SurveyMonkey or LimeSurvey are more appropriate.⁸³

LibQUAL+® has also been compared with other similar efforts in Australia. It is found to be a more efficient and effective solution compared to the Rodski instrument but

⁸² Richard Groves, "Sharing Best Practices by Disseminating Assessment Results via the Web," *ARL Bimonthly Report* 236 (October 2004): 6, <http://www.arl.org/newsltr/236/lqweb.html>.

⁸³ Frances M. Brillantine, "Using Surveys to Improve Service to Students: A Comparison of LibQUAL® and SurveyMonkey," *Law Library Lights* 50, no. 1 (Fall 2006): 5-9.

considerations of investment already made in the Rodski instrument by many Australian institutions are important politically.⁸⁴

Bruce Thompson documented the key elements of success by emphasizing the trustworthiness of the data and the various methodological approaches by which trustworthiness can be established. In particular, there are three questions that need to be considered in evaluating the scores: are respondents representative, do the scores measure anything and do the scores measure the correct something? The more than 1,000 individual studies conducted show that results are representative for most institutions, that scores are reliable (i.e. they do measure something - service quality), and that they are valid (they measure the correct something).

It is also very important to emphasize that the integrity of the scores from a given user is evaluated with data screening criteria for excessive number of 'not applicable' responses and excessive number of inconsistent responses.

⁸⁴ University of Technology, Sydney, "Report Comparing the UTS Experience with Client Surveys using Rodski in 2003 and the LibQUAL® Survey 2004 for CAUL," September 2004, <http://www.caul.edu.au/best-practice/caul20042RodskiLibQual.doc>.

And one of the most useful features of LibQUAL+® is the ability to triangulate quantitative with qualitative information in the form of comments: "These comments are at least as important as the ratings. Users tend to explain the basis for their views when they feel particularly strongly, either positively or negatively. Furthermore, when users are unhappy, they may feel compelled to be constructive in their criticisms, and they may say exactly what they would like done differently in the library."⁸⁵ From 2003 to 2008, more than 200 libraries have conducted annual LibQUAL+® surveys. More than 100,000 users responded to the survey each year, and more than 50,000 users provided valuable comments about the ways they use the libraries.⁸⁶

In 2005, libraries were able to conduct LibQUAL+® over a two-session period (Session I: January to May and Session II: July to December). The balance of central administration and local customization has been a critical component of the success of LibQUAL+®. As an option, for

⁸⁵ Bruce Thompson, "Research and Practice: Key Elements of Success for LibQUAL+®," *Library Assessment Conference - Thessaloniki 13-15 June 2005* (Washington, DC: Association of Research Libraries, 2006): 41-54.

⁸⁶ MaShana Davis, Richard Groves, and Martha Kyrillidou, *LibQUAL+® Procedures Manual* (Washington, DC: Association of Research Libraries, 2006).

instance, libraries can customize their local LibQUAL+® survey with five survey items from a large pool of more than 100 items. Many of these items are related to the standard LibQUAL+® dimensions.⁸⁷

The possibility of developing a short form of the LibQUAL+® instrument has also been explored using existing data and ties closely with the research pursued in this dissertation.⁸⁸ The testing and development of the LibQUAL+® Lite environment within an assessment gateway branded as StatsQUAL also addresses issues of providing tools that are applicable to narrow local assessment needs.⁸⁹

In 2005, the LibQUAL+® infrastructure moved from the Texas A&M facility to an external hosting facility incorporated under the larger ARL gateway, known as StatsQUAL. StatsQUAL is a gateway for innovative assessment tools libraries can use to improve their services (includes MINES for Libraries™ and DigiQUAL™, as briefly described below).

⁸⁷ Bruce Thompson, Colleen Cook, and Martha Kyrillidou, "Using Localized Survey Items to Augment Standardized Benchmarking Measures: A LibQUAL+™ Study," *portal: Libraries and the Academy* 2 (2006): 219–230.

⁸⁸ Bruce Thompson, Colleen Cook, and Fred Heath, "Two Short Forms of the LibQUAL+™ Survey Assessing Users' Perceptions of Library Service Quality," *Library Quarterly* 73 (2003): 453–465.

⁸⁹ E. Stewart Saunders, "The LibQUAL+ Phenomenon: Who Judges Quality," *Reference and User Services Quarterly* 47, no. 1 (Fall 2007): 21–24.

LibQUAL+® findings have engaged thousands of librarians in discussions with colleagues and ARL on what these findings mean for the local library, for its region, and for the future of libraries across the globe. As the information environment is changing rapidly, having current information on how academic users access information is critical.⁹⁰

Libraries led efforts to understand how the results can be used to alter resource allocation expenditures to improve customer satisfaction.⁹¹ Consortia have supported their members' participation in LibQUAL+® to offer an informed understanding of the changes in their environment.⁹²

Summary highlights have been published on an annual basis describing the rich array of information available through LibQUAL+®. Among the findings, the performance of military libraries affiliated with graduate schools and academies is

⁹⁰ Sarah Lippincott and Martha Kyrillidou, "How ARL University Communities Access Information: Highlights from LibQUAL+™," *ARL Bimonthly Report* 236 (October 2004): 7–8, <http://www.arl.org/newsltr/236/lqaccess.html>.

⁹¹ John H. Heinrichs, Thomas Sharkey, and Jeen-Su Lim, "Relative Influence of the LibQUAL+™ Dimensions on Satisfaction: A Subgroup Analysis," *College and Research Libraries* 66 (2005): 248–265.

⁹² Jeff Gatten, "The OhioLINK LibQUAL+™ 2002 Experience: A Consortium Looks at Service Quality," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 19–48, and co-published simultaneously in *Journal of Library Administration* 40:19–48; Jeff Gatten, "Measuring Consortium Impact on User Perceptions: OhioLINK and LibQUAL+™," *Journal of Academic Librarianship* 30, no. 3 (May 2004): 222–228; Tamera Lee, "Exploring Outcomes Assessment: The AAHSL LibQUAL+™ Experience," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 49–58, co-published simultaneously in *Journal of Library Administration* 40 (2004): 49–58.

noteworthy. These libraries exceed desired expectations on all the dimensions and items measured by LibQUAL+®.

Professional military education (PME) libraries serve the students, staff, and faculty of the U.S. post-graduate military colleges. Six of these special libraries

participated in the spring 2003 LibQUAL+® assessment. In every dimension of measured service quality, the military school libraries met or exceeded users' expectations.

Participants involved in this study reviewed the military library environment to identify factors that may contribute to the positive perceptions of library service and examined practical applications for other special libraries.⁹³

Sharing LibQUAL+® Results

LibQUAL+® findings indicate that users have an insatiable appetite for content, and no single library has adequate content to satisfy a vast number of its users. This social and individual need has been viewed as the 'library problem' but as Tefko Saracevic reminds us: "Digital libraries are often thought of as a technological fix for the traditional 'library problem', particularly given the explosion of digital knowledge records and information in

⁹³ J. Gail Nicula and Shirley B. Laseter, "LibQUAL™ and the Professional Military Library" (paper presented at the Special Libraries Association annual conference held in Nashville, TN, June 5–10, 2004), <http://www.sla.org/documents/libqual.doc>.

the contemporary milieu. But libraries always were, and in the digital age remain, a system for resolving social problems.”⁹⁴ To satisfy this insatiable need, libraries have served as a repository of knowledge and they have always been characterized with a strong tradition of collaboration, resource sharing, and openness to learning from one another. Though many organizations are engaged in total market surveys like LibQUAL+®, libraries are unique in their willingness to share their evaluation results with colleagues.

In a spirit of collaboration, LibQUAL+® participants share their results within the LibQUAL+® community with an openness that respects the confidentiality of each institution and its users. LibQUAL+® participants organize ShareFair meetings to understand how data can be used. A community mechanism for improving libraries shaped by the active involvement of the participating libraries has been one of the most tangible outcomes of emphasizing library service quality assessment. A virtual ShareFair has also been developed where libraries can showcase the marketing efforts they develop for promoting their libraries through

⁹⁴ Tefko Saracevic, “Introduction: The framework for Digital Library Evaluation,” in *Evaluation of Digital Libraries: An Insight to Useful Applications and Methods*, ed. Giannis Tsakonas and Christos Papatheodorou (Oxford: Chandos Publishing, 2009), 1-2.

the LibQUAL+® survey and for interpreting the results and shaping actions for organizational improvement.⁹⁵

**Through the Eyes of the Libraries: LibQUAL+® as Used by
Library Practitioners**

In 2002 Colleen Cook edited an award-winning volume of *Performance Measurement and Metrics* that includes articles from diverse perspectives on using LibQUAL+® data in local settings.⁹⁶ A second volume of articles published in 2004 included narratives about two large library consortia, OhioLINK and the Association of Academic Health Sciences Libraries (AAHSL). The reports from consortia speak to the need not only for collective action in fulfilling traditional library purchasing functions, but also for providing library service, conducting library service quality assessments, and attempting to identify benchmarks of exemplary library service.⁹⁷ Yet, a third volume of articles produced after ten years from the original LibQUAL+® implementation emphasizes many organizational

⁹⁵ LibQUAL+® Virtual ShareFair, <http://www.libqual.org/Information/ShareFair/index.cfm> (accessed October 1, 2009).

⁹⁶ Colleen Cook, ed., “The Maturation of Assessment in Academic Libraries: The Role of LibQUAL+®,” *Performance Measurement and Metrics* 3, no. 2 (2002): 34-112.

⁹⁷ Fred Heath, Martha Kyrillidou, and Consuella A. Askew eds., “Libraries Act on Their LibQUAL+® Findings: From Data to Action,” *Journal of Library Administration* 40, no. 3/4 (2004).

approaches as libraries integrate LibQUAL+® with strategic planning, methodological approaches that allow comparisons with other external instruments, and an integration of library assessment efforts within the larger set of priorities and emerging institutional cultures.⁹⁸ Practical suggestions on maximizing the use of an organization's LibQUAL+® results appear also independently in the professional literature as the recent articles by Dennis and Bower emphasize both the analysis of the comments⁹⁹ as well as maximizing the utility of the quantitative results.¹⁰⁰

Longitudinal studies using LibQUAL+® data are becoming possible. The University of Washington experience is initially described in "Assessing User Needs, Satisfaction, and Library Performance at the University of Washington (UW) Libraries." This article describes the results of the triennial faculty and student surveys since 1992 and compares some of these results with the 2000 LibQUAL+® pilot implementation, the first year of the LibQUAL+® pilot

⁹⁸ Martha Kyriolidou, ed., "LibQUAL+® and Beyond: Library Assessment with a Focus on Library Improvement," *Performance Measurement and Metrics* 9, no. 3 (2008): 157-230.

⁹⁹ Bradford W. Dennis and Tim Bower, "Using Content Analysis Software to Analyze Survey Comments," *portal: Libraries and the Academy* 8, no. 4 (2008): 423-437.

¹⁰⁰ Tim Bower and Bradford Dennis, "How to Get More From Your Quantitative LibQUAL+™ Dataset: Making Results Practical," *Performance Measurement and Metrics* 8, no. 2 (2007): 110-126.

that included only twelve ARL libraries. The article views the evolution of SERVQUAL into LibQUAL+® as a positive step as “the underlying concept of developing a standard instrument to measure service quality across libraries is a powerful one deserving institutional support. However, it cannot supplant local efforts to work closely with faculty and students to assess user needs and library collections and services. There are local issues at each institution that probably cannot be effectively addressed in a standardized survey tool.”¹⁰¹

The second article that traces the trajectory of the experience a couple of years later for the University of Washington identifies this institution as one of five institutions that participated in LibQUAL+® each year since its pilot phase in 2000, including 2001 and 2002. It discusses the integration of LibQUAL+® as another tool in the assessment toolbox. It points out that the local rich experience of UW lacked a sense of comparison with other institutions and LibQUAL+® provided a means to assess service quality in a broader context. In general, the experience continued to be viewed positively and the

¹⁰¹ Steve Hiller, “Assessing User Needs, Satisfaction, and Library Performance at the University of Washington Libraries,” *Library Trends* 49 (2001): 623.

article concludes that LibQUAL+® is not only useful for identifying deficiencies in service delivery but also for identifying service strengths. “Libraries need to understand what they do well as much as to discover what needs improvement.”¹⁰²

The University of Arizona experience is also described through a collection of articles as well. The University of Arizona has a rich tradition in quality management and team-based management. It is an organization that has emphasized continuous customer focus and has attempted to integrate the customer perspective in the decision-making process, practicing the disciplines of the learning organization.¹⁰³

Analysis of Comments

One of the elements examined in the dissertation is whether the Lite version of the protocol is producing proportionately more comments. The collection of comments and qualitative feedback has been instrumental for the

¹⁰² Steve Hiller, “Another Tool in the Assessment Toolbox: Integrating LibQUAL+™ into the University of Washington Libraries Assessment Program,” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 137; co-published simultaneously in *Journal of Library Administration* 40 (2004).

¹⁰³ Shelley Phipps, “Beyond Measuring Service Quality: Learning from the Voices of the Customers, the Staff, the Processes, and the Organization,” *Library Trends* 49 (2001): 635–661.

protocol's formative evaluation and also for the libraries themselves as they engage in improving their services.

The LibQUAL+® literature includes reports of several qualitative analyses of data. The Arizona study mentioned above emphasizes the use of comments. They have used the qualitative information collected as part of LibQUAL+® in the form of comments to inform strategic planning activities. They view the comments they get from LibQUAL+® as another piece of customer feedback that can be used to gauge the needs of the campus constituencies and to plan services to meet their needs.¹⁰⁴

An analysis of the spring 2001 LibQUAL+® comments using qualitative analysis software, Atlas.ti, was done to refine the instrument and reduce non-sampling error. Respondents' unsolicited e-mail messages were analyzed and results showed that, at that time, there were issues with the length of the survey. The information helped the survey designers reduce the number of items and focus on resolving

¹⁰⁴ Wendy Begay et al., "Quantifying Qualitative Data: Using LibQUAL+™ Comments for Library Wide Planning Activities at the University of Arizona," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 111-119.

technical issues with the Web-based survey.¹⁰⁵ Another library followed their LibQUAL+® survey results with select focus groups of graduate and undergraduate students to identify satisfaction with specific service points. The data indicated general satisfaction with the professional staff but a perceived lack of knowledge and positive service attitude by student workers. The data were used to improve library directional tools and staff training.¹⁰⁶ Vanderbilt University also reported that analysis of the comments corroborated other evidence that there were issues with the concept of an aging and confusing library building.¹⁰⁷ Overall about 40% of LibQUAL+® respondents provide comments, many of them readily actionable with specific, valuable suggestions. Libraries have real-time access to the comments provided by survey respondents.

Additional analysis of the comments focuses on the needs of faculty, undergraduates, and graduate students. This analysis of comments took place across a group of libraries and offered rich insights on qualitative trends that go

¹⁰⁵ Julie Guidry, "LibQUAL+™ Spring 2001 Comments: A Qualitative Analysis Using Atlas.ti," *Performance Measurement and Metrics* 3 (2002): 100-107.

¹⁰⁶ Gwyneth Crowley and Charles Gilreath, "Probing User Perceptions of Service Quality: Using Focus Groups to Enhance Quantitative Surveys," *Performance Measurement and Metrics* 3 (2002): 78-84.

¹⁰⁷ Flo Wilson, "LibQUAL+ at Vanderbilt University: What Do the Results Mean and Where Do We Go from Here?" *Journal of Library Administration* 40 (2004): 197-240.

beyond one single library. Among the findings it highlights a holistic model for approaching information from a user perspective and articulates dimensions of digital library service quality along two key concepts: content and community of users and creators. Dimensions of the quality of content of digital libraries include access, reliability, trustworthiness, scope, active links, browsability and organization. Dimensions of quality for the community of users and authors include navigability, self-sufficiency, trustworthiness, usability, and ability to fulfill purpose.¹⁰⁸

The Transformative Nature of LibQUAL+®

Tom Wall described LibQUAL+® as “a transformative experience,” and Joseph Boykin as “a confirming resource.” LibQUAL+® is seen as a new experience that creates opportunities for change as it provides the impetus for rethinking a library’s service programs. Both articles suggest that participation in this survey protocol should be viewed as a long-term effort accompanied with strong

¹⁰⁸ Yvonna Lincoln, Colleen Cook, and Martha Kyrillidou, “Evaluating the NSF National Science Digital Library Collections” (paper presented at the Multiple Educational Resources for Learning and Online Technologies [MERLOT] Conference, Costa Mesa, California, August 3–6, 2004), http://www.libqual.org/documents/admin/MERLOT%20Paper2_final.pdf.

commitment to listen to users and rethink operations.¹⁰⁹ It is an opportunity not only to confirm previously identified areas that need attention but also areas of strength within the library. Libraries have not only used these data to focus on the needs of faculty and students, but have also explored other demographic issues, such as gender.¹¹⁰ And, as was evident from early on LibQUAL+® has applicability and interest outside the Association of Research Libraries as both the Washburn University experience and the Miami University, Ohio, experience indicated.¹¹¹

The applicability of the LibQUAL+® protocol across groups of libraries has been documented by articles on the OhioLINK experience¹¹² and the Association of Academic Health Science Libraries (AAHSL) experience.¹¹³ Tom Sanville

¹⁰⁹ Tom Wall, "LibQUAL+™ as Transformative Experience," *Performance Measurement and Metrics* 3 (2002): 43-47; J. Boykin, "LibQUAL+™ as a Confirming Resource," *Performance Measurement and Metrics* 3 (2002): 74-77.

¹¹⁰ Eileen Hitchingham and Donald Kenney, "Extracting Meaningful Measures of User Satisfaction from LibQUAL+™ for the University Libraries at Virginia Tech," *Performance Measurement and Metrics* 3 (2002): 48-58.

¹¹¹ Wanda Dole "LibQUAL+™ and the Small Academic Library," *Performance Measurement and Metrics* 3 (2002): 85-95; Judith Sessions, Alex Schenck, and Aaron Shrimplin, "LibQUAL+™ at Miami University: A Look from Outside ARL," *Performance Measurement and Metrics* 3 (2002): 59-67.

¹¹² Jeff Gatten, "The OhioLINK LibQUAL+™ 2002 Experience: A Consortium Looks at Service Quality," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 19-48, co-published simultaneously in *Journal of Library Administration* 40 (2004): 19-48.

¹¹³ Tamera Lee, "Exploring Outcomes Assessment: The AAHSL LibQUAL+™ Experience," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A.

welcomes the appearance of a tool such as LibQUAL+®, justifying it as the tool for scalable consumer research that is badly needed in libraries.¹¹⁴ The experience of the health science libraries is described in more detail at Mercer University School of Medicine in Macon, Georgia,¹¹⁵ the University of Colorado Health Sciences Center,¹¹⁶ Duke University,¹¹⁷ and the Galter Health Sciences Library at Northwestern University.¹¹⁸ These articles are important because in general health science libraries have been viewed as having a much stronger focus on the user and often are complimented for delivering superior service

Askew (New York: Haworth Press, 2004), 49-58, co-published simultaneously in *Journal of Library Administration* 40 (2004): 49–58.

¹¹⁴ Tom Sanville, “Defending and Expanding Library Turf—The Need for Scalable Consumer Research,” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 13-18, co-published simultaneously in *Journal of Library Administration* 40 (2004): 13–18.

¹¹⁵ Jan H. LaBeause, “LibQUAL+(TM) in a Problem-Based Learning (PBL) Medical School: The Case Study of the Medical Library and Peyton T. Anderson Learning Resources Center (LRC) at Mercer University School of Medicine in Macon, Georgia” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 59-72, co-published simultaneously in *Journal of Library Administration* 40 (2004): 59-72.

¹¹⁶ Rick B. Forsman, “The Evolution and Application of Assessment Strategies at the University of Colorado Health Sciences Center,” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 73-82, co-published simultaneously in *Journal of Library Administration* 40 (2004): 73–82.

¹¹⁷ Richard B. Peterson et al., “The LibQUAL+™ Challenge: An Academic Medical Center’s Perspective, Duke University,” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 83-98, co-published simultaneously in *Journal of Library Administration* 40 (2004): 83–98.

¹¹⁸ James Shedlock and Linda Walton, “An Academic Medical Library Using LibQUAL+™: The Experience of the Galter Health Sciences Library, Northwestern University,” in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 99-110, co-published simultaneously in *Journal of Library Administration* 40 (2004): 99–110.

quality. It is important to note that the problem-based learning environment of the medical school at Mercer University School of Medicine was pointed out as a best practice example; it provides a strong community-based component and a small student body, fostering an environment of service excellence.

In many institutions conducting LibQUAL+®, there are immediate short-term actions resulting from LibQUAL+® results such as the redesigning of public services at the University of Pittsburgh.¹¹⁹ Two of the published articles explicitly link the implementation of LibQUAL+® to the strategic planning processes within the universities.¹²⁰ Several articles provide a framework for other libraries to follow as examples of best practice in data analysis. Wayne State analyzed the data in three different ways: (1) comparison with other institutions, (2) summary group analysis for local responses, and (3) analysis across

¹¹⁹ Beth McNeil and Joan Giesecke, "Using LibQUAL+™ to Improve Services to Library Constituents: A Preliminary Report on the University of Nebraska-Lincoln Experience," *Performance Measurement and Metrics* 3 (2002): 96-99; Amy E. Knapp, "We Asked Them What They Thought, Now What Do We Do? The Use of LibQUAL+ Data to Redesign Public Services at the University of Pittsburgh," *Journal of Library Administration* 40 (2004): 157-171.

¹²⁰ Stephen Shorb and Lori Driscoll; "LibQUAL+™ Meets Strategic Planning at the University of Florida," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 173-180; Lorraine Haricombe and Bonna Boettcher, "Using LibQUAL+™ Data in Strategic Planning: Bowling Green State University," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 181-196.

disciplines. Similar in-depth analysis by discipline was also conducted at Vanderbilt.¹²¹

The findings reported in these early documented efforts regarding the application of LibQUAL+® serve as a testimony of libraries' actions on service quality findings. The availability of the LibQUAL+® suite of services is an additional platform where these actions can be shared for collective learning and improvement.

Additional articles continue to appear in the literature giving us insights into the latest aspects of the implementations. Recent reports offer increasingly diverse perspectives. As larger numbers of libraries are implementing the protocol, we are seeing interesting findings being reported by small in size institutions even though the protocol was grounded in the research library environment.¹²² Harer was awarded the Emerald Literati Network Award for Excellence 2007, given annually to the

¹²¹ Barton Lessin, "Mining LibQUAL+™ Data for Pointers to Service Quality at Wayne State University," in *Libraries Act on Their LibQUAL+™ Findings: From Data to Action*, ed. F. M. Heath, M. Kyrillidou, and C. A. Askew (New York: Haworth Press, 2004), 139-156; Flo Wilson, "LibQUAL+™ at Vanderbilt University: What Do the Results Mean and Where Do We Go from Here?" *Journal of Library Administration* 40 (2004): 197-240.

¹²² John B. Harer, "LibQUAL+™ in Lilliput: Assessment Benefits for Small Academic Libraries," *Performance Measurement and Metrics* 7, no. 3 (2006): 193 -204.

Outstanding Paper published by Emerald Press, for his paper on "LibQUAL+™ in Lilliput." In particular, higher survey response rates by faculty are observed in smaller institutions and these institutions see the advantages of having a 'turnkey' solution to gathering user feedback. We are also seeing a focus on specific user groups depending on the orientation and priorities of each institution and a movement towards both the qualitative and quantitative evidence collected enhancing the end result of the decision making process.¹²³

We explored similarities and differences on library users' desired service quality levels across undergraduate students, graduate students and faculty, across geographic regions and across time. The sample consisted of 297,158 LibQUAL+® participants from the years 2004, 2005, and 2006, who completed the survey in American English and British English. "The stability in rankings is quite striking, given that the range of the mean values was so narrow. Usually, such stability in rankings occurs when ratings are more heterogeneous, because larger shifts in means must

¹²³ Maria Anna Jankowska, Karen Hertel, and Nancy J. Young, "Improving Library Service Quality to Graduate Students: LibQual+(TM) Survey Results in a Practical Setting," *portal: Libraries and the Academy* 6, no. 1 (January 2006): 59-76; William J. Hubbard and Donald E. Walter, "Assessing Library Services With LibQUAL+: A Case Study," *The Southeastern Librarian*, 53, no.1 (Spring 2005): 35-45; Michelle M. Foss, Amy Buhler, and Lenny Rhine, "HSCL LibQUAL+ 2004: From Numbers and Graphs to Practical Application," *Medical Reference Services Quarterly* 25, no. 1 (Spring 2006): 1-15.

occur for rank orders to be altered. Thus, these 297,158 LibQUAL+ participants made very subtle differentiations across items with respect to desired service qualities, but these small differences were nevertheless invariant across time ... The findings of similarities internationally was not entirely unexpected. One recent global study was the Online Computer Library Center Report on *Perceptions of Libraries and Information Resources*. The report highlighted the existence of a strong international 'universal' library brand."¹²⁴

The universal library brand is being marketed in innovative ways with the application of LibQUAL+® in all these different settings especially as libraries share their results readily with their immediate community and the world at large openly through the gray literature we see on the web. One of the major impacts of LibQUAL+® may be a loose, yet powerful, social network where the voices of more than a million library users are telling us their needs and wants through the survey box presented to them.

Valuable information on using LibQUAL+® and interpreting results has appeared in the gray literature of the Web. The

¹²⁴ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Library Users' Service Desires: A LibQUAL+ Study," *The Library Quarterly* 78, no. 1 (January 2008): 1-18.

various Web resources often offer only a snapshot of a specific implementation in a specific institution within a year, the quality of Web resources and presentation may vary, and the information is presented for the most part to satisfy the needs of the local community and to demonstrate the service improvements and commitment of the library. Some institutions have placed LibQUAL+® within the context of the larger assessment and service improvement efforts conducted by a library within a multi-year perspective.¹²⁵ More detail about the gray literature has already been published elsewhere for the interested reader.¹²⁶

Key Elements to the Success of LibQUAL+®

As libraries try to understand the differences among the dimensions LibQUAL+® measures, the importance of Information Control has emerged in a couple of recent studies. Saunders tries to answer the question whether academic libraries need to “improve general satisfaction with their services, or are some services more important than others?” He “asserts that faculty and students mainly

¹²⁵ Rachel Lewellen, “University of Massachusetts: Assessment and Statistics,” University of Massachusetts, <http://www.library.umass.edu/assessment/index.html> (accessed October 29, 2006); Fred Heath, *Service Quality Assessment and Improvement* (Austin: University of Texas). Available online at <http://www.lib.utexas.edu/vprovost/assessment/index.html> (accessed October 19, 2009).

¹²⁶ Martha Kyrillidou, Colleen Cook, and S. Shyam Sunder Rao, “Measuring the Quality of Library Service through LibQUAL+” *Academic Library Research: Perspectives and Current Trends* ed. Marie Radford and Pamela Snelson (Chicago: Association of College and Research Libraries, 2008), 270-275.

want information resources.” In his research he analyzes LibQUAL+® data to determine which other library resources contribute to information satisfaction among users. The conclusion is that access mechanisms are very important predictors of information resource satisfaction, but library facilities and library staff are negligible predictors. This is true across different groups of users.”¹²⁷ Kayongo and Jones also focus on perceptions of information control from the perspective of faculty.¹²⁸ Clearly, this is a dimension of rising importance for important segments of the user population.

The widespread application of LibQUAL+® is primarily due to the fact that it has reduced much of the labor and cost associated with survey management through the ease of the web administration interface. Library staff may use their creativity and knowledge of the local context in the process of drawing the sample, managing the survey notification and reminder process, developing an effective marketing campaign, and translating the results into

¹²⁷ E. Stewart Saunders, “Meeting Academic Needs for Information: A Customer Service Approach,” *portal: Libraries and the Academy* 8, no. 4 (2008): 357-371.

¹²⁸ Jessica Kayongo and Sherri Jones, “Faculty Perceptions of Information Control Using LibQUAL+ Indicators,” *The Journal of Academic Librarianship* 34, no. 2 (2008): 130-138.

positive actions for their organization.¹²⁹ LibQUAL+® has demonstrated that it can handle large numbers, the survey can be turned around quickly with the delivery of results within days of the survey closing, and there is limited need for local expertise regarding mechanical aspects of survey research. Interpretations should be carefully implemented across chosen cohorts, and additional analysis¹³⁰ can be conducted both in terms of the quantitative and qualitative data collected via LibQUAL+® since there are opportunities to discern user behaviors across the various demographic categories.

LibQUAL+® has made a number of important contributions to the measurement of effective delivery of library services. In particular: (a) shifted the focus of assessment from mechanical expenditure-driven metrics to user-centered measures of quality, (b) re-grounded gap theory for the library sector, especially academic libraries, (c) grounded questions yield data of sufficient granularity to be of value at the local level, (d) determined the degree to which information derived from local data can be generalized, providing much needed “best practices”

¹²⁹ MaShana Davis, Richard Groves, and Martha Kyrillidou, *LibQUAL+® Procedures Manual* (Washington DC: Association of Research Libraries, 2006).

¹³⁰ Amy E. Hoseth, “We Did LibQUAL+® - Now What? Practical Suggestions for Maximizing Your Survey Results,” *College and Undergraduate Libraries* 4, no. 3 (2007): 75-84.

information, (e) demonstrated the efficacy of large-scale administration of user-centered assessment transparently across the Web, and (f) makes little demand of local resources and expertise.

In summarizing the importance of LibQUAL+®, Colleen Cook points out its contribution both at the local level and for cross institutional benchmarking:

It has overcome the theoretical and practical obstacles that previously prevented large scale, multi institutional assessments in libraries. It assesses three overarching dimensions of library services ... from a user perspective. As a web delivered and managed survey, it is easy and cost effective in terms of time and money. A well crafted interactive management process for the survey is under continual refinement and allows the survey to be run simultaneously across hundreds of institutions throughout the world with a turnaround for data and analysis of only a few days ... LibQUAL+® longitudinal data has also shown how quickly user perceptions, and desired and minimum expectations have changed over the ... years of survey administration. Finally, LibQUAL+® data have yielded the first glimpses into how users assess the value added by libraries for higher education outcomes in teaching, learning and research.¹³¹

LibQUAL+® Methodological Studies

One of the first studies done by the researchers at Texas A&M University during the development of LibQUAL+® was a

¹³¹ Colleen Cook, "The Importance of the LibQUAL+® Survey for the Association of Research Libraries and Texas A&M University," *Library Assessment Conference - Thessaloniki 13-15 June 2005* (Washington, DC: Association of Research Libraries, 2006), 55-74.

meta-analysis of all the prior published research on what affects response rates to surveys administered on the Web. The article emphasized that "Response representativeness is more important than response rate in survey research. However, response rate is important if it bears on representativeness. A meta-analysis explored factors associated with higher response rates in electronic surveys reported in both published and unpublished research. The number of contacts, personalized contacts, and precontacts are the factors most associated with higher response rates in the Web studies analyzed."¹³² Survey length did not emerge as a relevant factor affecting response rate in this meta-analytic study. This influential article is one of the most highly cited articles written in the research stream generated by LibQUAL+® (cited 275 times as of April 2009).

The LibQUAL+® developers set out with a goal of ultimately creating a survey that would take no longer than 10 to 13 minutes to complete, and that hopefully would take even less time. As web surveys are becoming more and more widespread and respondents continue to complain about the redundancy of the protocol, the research team discussed in

¹³² Colleen Cook, Fred Heath, and Russell L. Thompson, "A Meta-analysis of Response Rates in Web- or Internet-based Surveys," *Educational and Psychological Measurement* 60 (2000): 821-836.

recent years ways to reduce the respondent burden and time even further.

During the first few years of developing the protocol, the survey had as many as 55 core items since the emphasis was to test items but never intended to retain all 55 items. The emphasis in these early years was on identifying (a) which items seemed to perform best, and (b) how many items should be used on each subscale in order to reflect users' priorities regarding the underlying dimensions of users' perceptions of library service quality. As a result we are currently using 22 core questions.

The survey developers also saw the potential for creating "short forms" of the protocol. Indeed, the development of two alternative abbreviated LibQUAL+® forms was documented in a 2003 article by Thompson, Cook and Heath. Two methods were examined for developing a 13-item version of the survey and both methods were found to produce results that are comparable and reliable like the long form of the protocol.¹³³

¹³³ Bruce Thompson, Colleen Cook, and Fred Heath, "Two Short Forms of the LibQUAL+™ Survey Assessing Users' Perceptions of Library Service Quality," *Library Quarterly* 73 (2003): 453-465.

In 2008 the ARL/Texas A&M research and development team tested an alternative form of the conventional LibQUAL+® survey, called "LibQUAL+® Lite." The Lite protocol uses item sampling methods to (a) gather data on all 22 LibQUAL+® core items, while (b) only requiring given individual users to respond to a subset of the 22 core questions. The mechanics of this item sampling strategy, and some results from the spring 2008 pilot testing of the "LibQUAL+® Lite" protocol, have been described in a recent article.¹³⁴ The replicability of these findings across different institutional settings is important to research both across different institutions as well as for different subgroups of respondents within the institutions that implement the LibQUAL+® Lite protocol.

The LibQUAL+® Lite protocol is being implemented in such a manner that individual libraries determine what percentage of their users are RANDOMLY assigned the traditional LibQUAL+® protocol, and what percentage are RANDOMLY assigned the LibQUAL+® Lite protocol.

¹³⁴ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The "LibQUAL+® Lite" Example," *Performance Measurement and Metrics* 10, no. 1 (2009): 6-16.

Super Crunchers

In his recent book entitled *Super Crunchers*, Ian Ayres is outlining how Super Crunching, statistical analysis that impacts real-world decision making, is changing the ways intuition and experience are applied in business and government as decision makers are looking for better ways to do things. He introduces two statistical techniques, regression and randomized trials, and in chapter 2 he presents lucid explanations and examples of how randomized trials are used in shaping real decision making in banks and credit companies as well as in the ways information is presented on the web.¹³⁵

In 1925, Ronald Fisher, the father of modern statistics, formally proposed using random assignments to test whether particular medical interventions had some predicted effect. The first randomized trial on humans (of an early antibiotic against tuberculosis) didn't take place until the late 1940s. But now, with the encouragement of the Food and Drug Administration, randomized tests have become the gold standard for proving whether or not medical treatments are efficacious.¹³⁶

Randomization ensures that, on average, those receiving a treatment, or an intervention, and those that are not, are pretty much the same on every other dimension. It does not

¹³⁵ Ian Ayres, *Super Crunchers: How Anything Can Be Predicted* (London: John Murray, 2008), 46-63.

¹³⁶ *Ibid.*, 46.

ensure that the members of the two groups are exactly the same, but it ensures that on average the distributions on general characteristics outside the control of the investigator are the same. "So, any differences in the average response rate between the two groups must be caused by the difference in the treatment... [Or,] Since the distribution of both groups becomes increasingly identical as the sample size increases, then we can attribute any differences in the average group response to the differences in treatment."¹³⁷

Ayres goes on explaining how Offermatica.com has turned Internet randomization into an art form helping companies like Monster.com decide what is the best alternative among 128 different page permutations and Jo-Ann Fabrics decide the effect of a promotional campaign. Even the title of Ayres' book was the result of Super Crunching through Google AdWords presenting to people searching for 'data mining' and 'number crunching' two alternative titles: Super Crunchers and The End of Intuition.¹³⁸ The book presents many examples of how well designed experiments and

¹³⁷ Ibid., 51.

¹³⁸ Ibid., 52-56.

evidence-based decision making are improving the way people develop actions and policies.

Many characteristics of web based surveys require special consideration. Dillman et al. are providing guidelines in their review of the state of the art of web based surveys.¹³⁹ In the library field, Bertot has documented the evolution of web-surveys especially highlighting the many new features these surveys have developed over the last decade. With the application of more sophisticated web interfaces context is becoming as important as some other features like the ability to prepopulate data, automatic routing, question response error check frequently on the fly, survey completion verification, and the ability to print and download responses in a variety of enhanced ways that improve analytical capabilities.¹⁴⁰

Web Surveys and Randomized Control Trials

In the next section we are reviewing some studies in survey research that specifically focus on survey length and response rates. Few studies have examined systematically the length of the survey and response rates. Some studies

¹³⁹ Don A. Dillman et al., 271-299.

¹⁴⁰ John Bertot, "Web-Based Surveys: Not Your Basic Survey Anymore," *Library Quarterly* 79, no. 1 (2009): 119-124.

focus on print surveys and some on web surveys, and some compare the two modes. Typically length is studied together with other characteristics.

Three articles below summarize early experimental studies on print based surveys and how length affects response rate. "An experimental study of alternatives to the current U.S. decennial census questionnaire shows that shortening the questionnaire and respondent-friendly questionnaire design improve response, whereas asking a potentially difficult and/or objectionable question, that is social security number, lowers response."¹⁴¹ A second article summarizes two experimental studies on questionnaire length demonstrating that response rates are affected significantly, "particularly when survey salience is high and questionnaire lengths differ greatly. With low salience and modest differences in questionnaire length, however, the effects of response rate tend to be small and inconsistent ... the authors found no evidence of survey bias in longer surveys with lower response rates."¹⁴² Similar

¹⁴¹ Don A. Dillman, Michael D. Sinclair, and Jon R. Clark, "Effects of Questionnaire Length, Respondent-Friendly Design, and a Difficult Question on Response Rates for Occupant-Addressed Census Mail Surveys," *Public Opinion Quarterly* 57, no. 3 (1993): 289-304.

¹⁴² Andrew G. Bean and Michael J. Roszkowski, "The Long and Short of It: When Does Questionnaire Length Affect Response Rate?" *Marketing Research* 7, no. 1 (1995): 20-26.

findings are reported in another survey of students of a distance education course. "In 14 replications, persons were randomly assigned to receive a long or short course evaluation questionnaire. Response rate for the short form averaged about 28% higher than for the long form, and was significantly higher in all 14 replications. A measure of course satisfaction appearing on both questionnaires showed no significant differences between the long and short form in 12 of the 14 replications. The results suggested that biased measurement of consumer satisfaction does not necessarily occur on a long questionnaire with a relatively low response rate."¹⁴³

A comparison between web-based and paper-based survey methods tested assumptions of survey mode and response cost. The study reports that response rates are better in mixed-mode surveys though more expensive. Web-based surveys produce more results in a cost effective manner. Print-based mode surveys were the most expensive.¹⁴⁴

¹⁴³ Michael J. Roszkowski and Andrew G. Bean, "Believe It or Not! Longer Questionnaires Have Lower Response Rates," *Journal of Business and Psychology* 4, no. 4 (1990): 495-509.

¹⁴⁴ Corey Greenlaw and Sharon Brown-Welty, "A Comparison of Web-Based and Paper-Based Survey Methods: Testing Assumptions of Survey Mode and Response Cost," *Evaluation Review* 33, no. 5 (2009): 464-480.

"Much of the time spent on processing the questions [in a survey] involves reading and interpreting them." In this study the findings indicate that "response times are affected by question characteristics such as the total number of clauses and the number of words per clause that probably reflect reading times. In addition, response times are also affected by the number and type of answer categories, and the location of the question within the questionnaire, as well as respondent characteristics such as age, education and experience with the Internet and with completing web surveys."¹⁴⁵ The study had a key limitation that the findings are correlational and encourages further work with experimental approaches.

Deutskens et al. point out that many correlational and meta-analytic studies focus on response rates and ignore the quality of the results. In an effort to study both, an experimental approach was designed examining the "effect of timing of follow-ups, different incentives, length, and presentation of the questionnaire on the response rate and

¹⁴⁵ Ting Yan and Roger Tourangeau, "Fast Times and Easy Questions: The Effects of Age, Experience and Question Complexity on Web Survey Response Times," *Applied Cognitive Psychology* 22 (2008): 51-68.

response quality” in an online environment.¹⁴⁶ “The results show that shorter questionnaires have a higher response rate, although long questionnaires still generate surprisingly high response.” Another experimental study shows that expected time burden, survey appearance, and official sponsorship can have an influence on survey response rates.¹⁴⁷ Among many factors e-mail personalization was the only important factor that increases web survey response rates in another reported experiment.¹⁴⁸

Matrix Sampling

Matrix sampling (also known as “split-questionnaire” design) was applied in developing the LibQUAL+® Lite pilot where every person is presented with a different and smaller number of items from the larger item pool. In particular: “a) all users answer a few, selected survey questions (i.e., three core items), but (b) the remaining survey questions are answered ONLY by a randomly-selected subsample of the users. Thus, (a) data are collected on all

¹⁴⁶ Elisabeth Deutskens, Ko De Ruyter, Martin Wetzels, and Paul Oosterveld, “Response Rate and Response Quality of Internet-Based Surveys: An Experimental Study,” *Marketing Letters* 15, no. 1 (2004): 21.

¹⁴⁷ Jill T. Walston, Robert W. Lissitz, and Lawrence M. Rudner, “The Influence of Web-Based Questionnaire Presentation Variations on Survey Cooperation and Perceptions of Survey Quality,” *Journal of Official Statistics* 22, no. 2 (2006): 271-291.

¹⁴⁸ Dirk Heerwegh and Geert Loosveldt, “An Experimental Study on the Effects of Personalization, Survey Length Statements, Progress Indicators, and Survey Sponsor Logos in Web Surveys,” *Journal of Official Statistics* 22, no. 2 (2006): 191-210.

questions, but (b) each user answers fewer questions, thus shortening the required response time.”¹⁴⁹

Matrix sampling has been applied in educational large-scale assessments¹⁵⁰ because it reduces the burden of time commitment in taking a test as it reduces the number of items each person has to take or respond to. Popham articulates eloquently how matrix sampling can help circumvent the high costs of authentic assessment and provides good historical background on the genesis of matrix sampling. He also makes a distinction between *genuine matrix sampling*, which features low-proportion **sampling of respondents as well as assessment tasks**. In those cases where all students complete different samples of items, he suggests the use of the term *item sampling*.¹⁵¹ In the context of the LibQUAL+® Lite survey protocol whether the approach is characterized as genuine matrix sampling or item sampling will depend on whether the library is doing a sample or a population survey.

¹⁴⁹ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, “Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example,” *Performance Measurement and Metrics* 1 (2009): 6-16.

¹⁵⁰ Gail F. Munger and Brenda H. Loyd, “The Use of Multiple Matrix Sampling for Survey Research,” *Journal of Experimental Education* 56 (4) (1988): 187-191.

¹⁵¹ W. James Popham, “Circumventing the High Costs of Authentic Assessment,” *The Phi Delta Kappan*, 74 (6) (1993): 473.

Matrix sampling makes score reporting more complex and care needs to be exercised in understanding the risks and potential disadvantages. Childs and Jaciw present a discussion of matrix sampling along nine categories of costs: "development costs, materials costs, administration costs, educational costs, scoring costs, reliability costs, comparability costs, validity costs, and reporting costs." They advise that in "choosing among test designs, a testing program should examine the costs in light of its mandate(s), the content of the tests, and the financial resources available, among other considerations."¹⁵²

In a review article on "Multiple Matrix Sampling" Gonzalez and Eltinge¹⁵³ provide an overview covering the origins, the fields where it has been applied most and discuss how it can be applied in surveys and examine its application in the context of The Consumer Expenditure Quarterly Interview Survey (CEQ), an ongoing panel survey of U.S. households. They highlight some notable previous applications in government and public health. In particular, they mention

¹⁵² Ruth A. Childs and Andrew P. Jaciw, "Matrix sampling of items in large-scale assessments," *Practical Assessment, Research & Evaluation*, 8 (16) (2003). Retrieved November 23, 2009 from <http://PAREonline.net/getvn.asp?v=8&n=16>.

¹⁵³ Jeffrey M. Gonzalez and John L. Eltinge, "Multiple Matrix Sampling: a Review," *Section on Survey Research Methods: BLS Statistical Survey Papers* (Washington, DC: Bureau of Labor Statistics, 2007): 3069-3075.

the work done with the 2000 Decennial Census by Navarro and Griffin, the Internal Revenue Service (IRS) application in the 1980s, and the 1995 application by Raghunathan and Grizzle¹⁵⁴ with the Cancer Risk Behavior Survey.

They are highlighting three areas for consideration when splitting a questionnaire: (a) questionnaire development, (b) data collection and (c) processing and analysis. We briefly summarize their remarks and elaborate on these aspects in the context of LibQUAL+® Lite.

In developing matrix sampling approaches one needs to consider carefully the objectives of the survey and needs to inform decisions by the characteristics of the existing survey. For example, a main objective of the LibQUAL+® survey is to provide estimates of service quality within each of the dimensions measured (Affect of Service, Information Control, and Library as Place). Questions in each dimension are related both contextually and logically and all 22 core LibQUAL+® questions and the three dimensions reflect the main concept, library service quality. Therefore any decision regarding a Lite form

¹⁵⁴ Trivellore E. Raghunathan and James E. Grizzle, "A Split Questionnaire Survey Design," *Journal of the American Statistical Association* 90 (1995): 54–63.

should meet the goals of measuring both the overarching concept and the three dimensions. Therefore questions were randomly selected within each dimension slot.

The authors also highlight that decisions regarding item selection may be based on either statistical criteria or through the development of an algorithm. For the LibQUAL+® Lite experiment, for example, it is important to examine whether there is a difference in the scores between the long and the Lite form. Therefore, a decision was made to keep constant three linking items (one for each dimension) across all administrations. These three linking items were selected based on statistical criteria from factor analysis that shows which three items have the strongest relation with the underlying dimension measured. These three items formed the core or "high priority" list for the LibQUAL+® Lite experiment.

The last consideration articulated in the Gonzalez and Eltinge article is the number of forms. LibQUAL+® Lite is designed as a web survey and the forms are generated dynamically drawing randomly items from the non-linking items within different blocks of questions representing the

dimensions for the 22 core items. The survey is thus unique for each person taking the survey.

Because of the standardized nature of the LibQUAL+® survey and the emphasis on measuring perceptions and expectations there are no major cognitive demands in terms of the concepts measured. There are cognitive demands of a different nature though created by the need to measure minimum as well as desired expectations in addition to the library performance scores so that perceptions are placed within the zone of tolerance concept articulated in the SERVQUAL theory and its practical applications. This study did not address sampling regarding the response scales of the LibQUAL+® survey; it focused rather on the items.

The second phase of the survey process that needs consideration is the data collection process. "This involves determining which sample members receive which form."¹⁵⁵ Again the design should be consistent with the objectives of the original survey. LibQUAL+® has been designed as a total market survey for an academic research library environment aiming at collecting information for

¹⁵⁵ Jeffrey M. Gonzalez and John L. Eltinge, "Multiple Matrix Sampling: a Review" *Section on Survey Research Methods: BLS Statistical Survey Papers*, (Washington, DC: Bureau of Labor Statistics, 2007): 3073.

all major user groups, undergraduate and graduate students as well as faculty. Therefore the survey is presented in its Lite form to all user groups and there is not ability to differentiate the proportion of Lite surveys received for different user groups.

In terms of the processing and analysis of the data from a matrix sampling design, consideration should be given to imputation techniques and in the context of LibQUAL+® Lite these methods need to be actively researched. "Thus, general acceptance of these methods as well as our understanding of how to utilize them and their implications may increase in the future."¹⁵⁶ For LibQUAL+® Lite forms are created in such a way that each form includes items that are predictive of the excluded items, so subsequent analysis and development of imputation methods can be explored.¹⁵⁷

The goal in developing the LibQUAL+® Lite experiment much like the CEQ survey method described, was to "explore

¹⁵⁶ Ibid., 3074.

¹⁵⁷ Neal Thomas, Trivellore E. Raghunathan, Nathaniel Schenker, Myron J. Katzoff and Clifford L. Johnson. "An Evaluation of Matrix Sampling Methods Using Data from the National Health and Nutrition Examination Survey," *Survey Methodology (Statistics Canada Catalogue no. 12-001)* 32 (2) (2006): 217-231.

whether multiple matrix sampling will improve data quality by decreasing respondent burden, lower nonresponse rates, and decrease long-term data collection costs (aside from the initial costs incurred)."¹⁵⁸ The present LibQUAL+® experimental study is building upon the corpus of marketing, educational and social science research that addresses effective ways of conducting large scale assessments and web-based surveys. Our contribution is particularly relevant to the library field as the experiment described in the following chapters relates to the widely applied LibQUAL+® protocol.

What LibQUAL+® Is Not

LibQUAL+® is not and should not be the only evaluation libraries deploy. It has a specific place in the library evaluation literature being a total market survey, but it does not provide the answer to all the questions libraries need to know. Libraries need to engage in transaction based surveys¹⁵⁹ and multiple other ways of collecting evidence

¹⁵⁸ Jeffrey M. Gonzalez and John L. Eltinge, "Multiple Matrix Sampling: a Review," *Section on Survey Research Methods: BLS Statistical Survey Papers* (Washington, DC: Bureau of Labor Statistics, 2007): 3074.

¹⁵⁹ Brinley Franklin and Terry Plum, "Assessing the Value and Impact of Digital Content," *Journal of Library Administration* 48, no. 1 (2008): 41-47; and Brinley Franklin and Terry Plum, "Successful Web Survey Methodologies for Measuring the Impact of Networked Electronic Services (MINES for Libraries)," *IFLA Journal* 32, no. 1 (2006): 28-40.

such as focus group interviews,¹⁶⁰ anthropological observations,¹⁶¹ analysis of existing artifacts and documents, usability studies¹⁶² and a multiplicity of quantitative and qualitative approaches that can enrich their presence and ability to describe their effectiveness. LibQUAL+® can be placed within a wider framework of organizational development¹⁶³ and strategy mapping.¹⁶⁴ It is part of the evidence-based¹⁶⁵ movement and accountability¹⁶⁶ culture that libraries are asked to promote systematically.

Finding the right numbers in interpreting the LibQUAL+® data may be challenging. Within the framework of measuring minimum expectations, desired expectations and perceptions

¹⁶⁰ Eric C. Shoaf, "Using a Professional Moderator in Library Focus Group Research," *College and Research Libraries* 64 (2003): 124-132.

¹⁶¹ Nancy Foster and Susan Gibbons, ed. *Studying Students: The Undergraduate Research Project at the University of Rochester* (Chicago: Association of College and Research Libraries, 2007).

¹⁶² Michael J. Prasse and Lynn S. Connaway, "Usability Testing: Method and Research," *Academic Library Research: Perspectives and Current Trends*, ed. Marie L. Radford and Pamela Snelson (Chicago: Association of College and Research Libraries, 2008), 253-301.

¹⁶³ Keith Russell, "Evidence-Based Practice and Organizational Development in Libraries," *Library Trends* 56, no. 4 (2008): 910-930.

¹⁶⁴ Robert Kaplan and David Norton, *Strategy Maps: Converting Intangible Assets Into Tangible Outcomes* (Cambridge, MA: Harvard Business School, 2004); and Jim Self, "Using Data to Make Choices: The Balanced Scorecard at the University of Virginia Library," *ARL* 230/231 (October/December 2003): 28-29.

¹⁶⁵ Andrew Booth and Anne Brice, ed. *Evidence Based Practice: An Information Professionals Handbook* (London: Facet, 2004); Denise Koufogiannakis, Linda Slater, and Ellen Crumley, "A Content Analysis of Librarianship Research," *Journal of Information Science* 30, no. 3 (2004): 227-239.

¹⁶⁶ U.S. Department of Education, *A Test of Leadership: Charting the Future of U.S. Higher Education: A Report of the Commission Appointed by Secretary of Education Margaret Spellings* (Washington, DC: U.S. Department of Education, 2006).

of library service, LibQUAL+® provides three scores directly derived from users and two calculated scores, the service adequacy gap (the difference between perceptions and minimum expectations) and the service superiority gap (the difference between perceptions and desired expectations). Finding out which figures one may use for what purposes is not intuitive to many librarians but practitioners have published research that provides guidance in this area. Jim Self, for example, recommends the use of the zone of tolerance where you can see perceptions charted between minimum and desired expectations in a series of bar charts instead of the popular radar charts that summarize all 22 core questions.¹⁶⁷

In many ways LibQUAL+® raises as many questions as it answers. These issues need to be addressed with collective and local actions. In particular, there is great concern that across all institutions surveyed faculty rate the library systematically low on issues regarding access to the full-text journals needed for their work. Such findings

¹⁶⁷ Jim Self, "LibQUAL+®: Finding the Right Number," presented at the LibQUAL+(R) meeting in Stellenbosch, South Africa, August 13, 2007, http://www.libqual.org/documents/admin/LQ_PM7gr2.ppt.

are calls for collective action and exploration of solutions for reversing these perceptions.¹⁶⁸

As we have seen libraries have used LibQUAL+® for strategic planning purposes. Yet limitations were expressed by one of these libraries in that the results do not map to the strategic goals: "What is evident is that libraries are using LibQUAL+ results as a repository of information from which aspects of the strategic plan can be implemented. What is more tenuous is using this information to actually map out the strategic plan. Purdue Libraries discovered this when it undertook to create a new strategic plan in 2006. LibQUAL+ was administered in 2005 with the idea that the results could be used to formulate the plan. As they progressed, the planning team realized that the shortfalls in library service as revealed by LibQUAL+ were focusing attention on the sins of the past and not on the possibilities of the future. This does not mean that LibQUAL+ was a futile exercise. On the contrary, its measures turn up frequently in the plan as a metric for

¹⁶⁸ Jim Self, "Bound for Disappointment: Faculty and Journals at Research Institutions," *ARL: A Bimonthly Report on Research Library Issues and Actions from ARL, CNI and SPARC* 257 (April 2008): 7-9, <http://www.arl.org/bm~doc/arl-br-257-bound.pdf> (accessed September 30, 2009). The report was originally presented at the 7th Northumbria International Conference on Performance Measurement in Libraries and Information Services (PM7), August 13-16, 2007, in South Africa, http://www.libqual.org/documents/admin/jim_PM7f.ppt.

determining progress toward the goals of the strategic plan; what LibQUAL+ did not do was set the goals of the strategic plan.”¹⁶⁹

Researchers recognize that users have a limited frame of reference and tend to offer incremental, rather than bold, suggestions. Stewart Saunders in a recent article points out that ‘only customers judge reality, all other judgments are essentially irrelevant’ is not always the accepted perception: “all other judgments are not essentially irrelevant. Customers are best able to judge how a service is delivered through their own perceptions. With their professional training, however, librarians are in many ways better positioned than the customers to judge the overall quality of “what” is delivered: that is, they can best judge the technical quality of the library.”¹⁷⁰ So, a distinction between technical quality and functional quality is drawn where technical quality is the actual objective service delivered and functional quality is how service is delivered.¹⁷¹

¹⁶⁹ E. Stewart Saunders, “The LibQUAL+ Phenomenon: Who Judges Quality?” *Reference and User Services Quarterly* 47, no. 1 (2007): 23.

¹⁷⁰ *Ibid.*, 24.

¹⁷¹ William B. Edgar, “Questioning LibQUAL+: Expanding its Assessment of Academic Library Effectiveness,” *portal: Libraries and the Academy* 6 (October 2006): 445-465.

Other researchers point out the responsibility of the professional in developing innovation. Innovation is the professional responsibility of the staff working in an organization. Anthony Ulwick urges researchers to shift their focus to outcomes and truly understand the driving forces behind users' behavior. He uses the development of the ubiquitous "sticky" note as an example. Focusing on outcomes will help jumpstart innovation. "When desired outcomes become the focus of customer research, innovation becomes a manageable, predictable discipline."¹⁷²

An emphasis on outcomes has also been the latest focus of work done by Hernon and colleagues.¹⁷³ Service quality and satisfaction can be viewed from the perspective of outcomes as well. Appreciative inquiry techniques and the university summit that have been implemented by various institutions are among the frameworks libraries can use to foster positive outcomes in relation to quality service and satisfaction.¹⁷⁴ In studying the relation of the LibQUAL+®

¹⁷² Anthony W. Ulwick, "Turn Customer Input into Innovation," *Harvard Business Review* 80, no. 1 (January 2002): 91-97.

¹⁷³ Peter Hernon and Robert E. Dugan, *An Action Plan for Outcomes Assessment in Your Library* (Chicago: ALA, 2002); Peter Hernon, Robert E. Dugan, and Candy Schwartz, eds. *Revisiting Outcomes Assessment in Higher Education* (Westport and London: Libraries Unlimited, 2006).

¹⁷⁴ Martha Kyrillidou, "Service Quality: A Perceived Outcome for Libraries," in *Revisiting Outcomes Assessment in Higher Education*, ed. P. Hernon, R. E. Dugan, and C. Schwartz (Westport and London: Libraries Unlimited, 2006), 331-366.

dimension to satisfaction and outcomes, there is a stronger relation between the Affect of Service dimension and satisfaction, as opposed to outcomes. Information Control, on the other hand, is more closely related to positive academic outcomes.¹⁷⁵

Embracing Service Quality Improvement

Quality much like beauty is in the eye of the beholder as Nitecki and Olshen have articulated in the six-week online training they offered to hundreds of librarians through ARL.¹⁷⁶ In their study of online lyceum participants, they examined the following: expectations for staff development to prepare librarians to embrace service quality improvement as a management approach to delivering service; the perceived readiness of library organizations to support a culture of assessment; and the effectiveness of web-based teaching and learning technologies in developing the requisite skills. At that time, they drew two conclusions, that library organizations are not ready to transform libraries into well-managed service quality operations and

¹⁷⁵ Bruce Thompson, Colleen Cook, and Martha Kyriallidou, "Concurrent Validity of LibQUAL+™ Scores: What Do LibQUAL+™ Scores Measure?" *Journal of Academic Librarianship* 31 (2006): 517–522.

¹⁷⁶ Danuta A. Nitecki and Toni Olshen, "Developing Service Quality Measurement Skills Through an Online Course for Librarians," in *Proceedings of the 4th Northumbria International Conference on Performance Measurement in Libraries and Information Services*, ed. J. Stein, M. Kyriallidou, and D. Davis (Washington, DC: Association of Research Libraries, 2002): 235–244.

that the need is great for preparing librarians to lead this transformation.

The number of libraries implementing LibQUAL+® has continued to grow since then. The needs for developing more sophisticated assessment skills and building expertise within each organizational context is becoming urgent. For a number of years ARL has sponsored the ARL Service Quality Evaluation Academy, to aim at increasing the research and methodological skills of library professionals through an intensive one-week exposure to quantitative and qualitative research methods. More recently, in response to Nitecki and Olshen's admonition for developing "'communities of practice' in the area of service quality assessment," the first Library Assessment Conference was organized and offered in September 2006 in Charlottesville, VA.¹⁷⁷ Post-conference discussion on library assessment issues takes place in the library assessment blog at <http://www.libraryassessment.info/> – a blog established in 2006 as a follow up, to sustain the community concerned with library assessment issues. Another available forum is

¹⁷⁷ Ibid., 243.

the ARL-ASSESS list available at

<https://mx2.arl.org/Lists/ARL-ASSESS/List.html>.

The conference proceedings offer a glimpse to the diversity of assessment approaches that are emerging in libraries including service quality assessment,¹⁷⁸ qualitative analysis,¹⁷⁹ building assessment capacity in libraries,¹⁸⁰ return on investment,¹⁸¹ information literacy assessment,¹⁸²

¹⁷⁸ Duane Webster, "Library Assessment: Demonstrating Value-Added in a Time of Constrained Resources and Unique Opportunities," 1-4; John V. Lombardi, "On the Research Library: A Comment," 5-8; Sayeed Choudhury, Martha Kyrillidou, Fred Heath, Colleen Cook, Bettina Koeper, and Reinhold Decker, "LibQUAL®, ProSeBiCa (Development of New Library Services by Means of Conjoint Analysis), and CAPM (Comprehensive Access to Printed Materials)," 9-14, also published in *Performance Measurement and Metrics* 9, no. 3 (2008): 216-222; Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "How You Can Evaluate the Integrity of Your Library Quality Assessment Data: Intercontinental LibQUAL+® Analyses Used as Concrete Heuristic Examples," 15-32; also published in *Performance Measurement and Metrics* 9, no. 3 (2008): 202-215; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁷⁹ Agnes Tatarka et al., "Wayfinding in the Library: Usability Testing of Physical Spaces," 33-42; Margie Jantti, "Assessing the Service Needs and Expectations of Customers--No Longer a Mystery," 43-52; Terri L. Holtze et al., "Frequently Noted: Approaches to Analyzing Qualitative Research," 53-62; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁰ Lisa J. Hinchliffe and Tina E. Chrzastowski, "Getting Started with Library Assessment: Using Surveys to Begin an Assessment Initiative," 63-68; Melissa Becher and Mary Mintz, "A Leap in the Right Direction: How a Symbiotic Relationship between Assessment and Marketing Moves the Library Forward," 69-82; Susan Bailey and Charles Forrest, "Assessment in the Emory University Libraries: Lurching Toward Sustainability," 83-90; Eric Ackerman, "Library Assessment on a Budget: Using Effect-Size Meta-Analysis to Get the Most out of the Library-Related Survey Data Available Across Campus," 117-126; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸¹ Brinley Franklin, "Return on Investment," *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007), 127-130. Along the lines of the economics in higher education, also see by the same author: "The Privatization of Public University Research Libraries," *portal: Libraries and the Academy* 7 (October 2007): 407-414.

¹⁸² Joseph A. Salem and Carolyn J. Radcliff, "Using the SAILS Test to Assess Information Literacy," 131-138; Louise R. Fluk et al., "The Fourth 'R': Information Literacy in Institutional Assessment," 177-200; Megan Oakleaf, "The Right Assessment Tool for the Job: Seeking a Match between Method and Need,"

evaluation and research methodologies,¹⁸³ strategic planning,¹⁸⁴ assessment of learning spaces,¹⁸⁵ applications of the balanced scorecard,¹⁸⁶ assessment of internal organizational climate,¹⁸⁷ digital libraries,¹⁸⁸ and value

201-214; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸³ Neal K. Kaske, "Choosing the Best Tools for Evaluating Your Library," 215-224; John T. Snead et al., "Developing Best-Fit Evaluation Strategies," 225-232; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁴ Dan O'Mahoney and Raynna Bowlby, "Accountability to Key Stakeholders," 233-245; E. Stewart Saunders, "Drilling the LibQUAL® Data for Strategic Planning," 245-250; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁵ Joan K. Lippincott, "Assessing Learning Spaces," 251-258; Rachel Lewellen and Gordon Fretwell, "Combining Quantitative and Qualitative Assessment of an Information Common," 259-262; Kimberly B. Sweetman and Lucinda Covert-Vail, "Listening to Users: The Role of Assessment in Changing Library Space to Meet User Needs," 263-284; Aaron K. Shrimplin and Matthew Magnuson, "Net Generation Students and the Library as Place," 285-292; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁶ Joseph R. Matthews, "Balanced Scorecard in Public Libraries: A Project Summary," 293-302; Susanna Pathak, "The People Side of Planning and Implementing a Large Scale Balanced Scorecard Initiative," 303-318; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁷ Myra Sue Baughman et al., "From Organizational Assessment to Organizational Change: The University of Maryland Experience," 319-330; Laura Lillard, "Diversity and Organizational Culture Survey: Useful Methodological Tool or Pandora's Box?" 331-348; Nancy Slight-Gibney, "Looking In and Looking Out: Assessing our Readiness to Embrace the Future," 349-358; Paul Hanges et al., "Diversity, Organizational Climate, and Organizational Culture: The Role They Play in Influencing Organizational Effectiveness," 359-358; Carol Shepstone and Lyn Currie, "Assessing Organizational Culture: Moving towards Organizational Change and Renewal," 369-380; Yvonne Belanger, "Tools for Creating a Culture of Assessment: the CIPP-Model and Utilization-Focused Evaluation," 381-386; Irma F. Dillon and Maggie Saponaro, "The Use of Outcome-Based Evaluation (OBE) to Assess Staff Learning Activities at the University of Maryland Libraries," 387-392; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁸⁸ Judy Jeng, "Usability Assessment of Academic Digital Libraries," 393-408; Maribeth Manoff et al., "All That Data: Finding Useful and Practical Ways to Combine Electronic Resource Usage Data from Multiple Sources," 409-416; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

and impact studies.¹⁸⁹ The multiplicity of approaches continues to emerge strongly in the papers and research presented at the second library assessment conference in Seattle, August 4-6, 2008.¹⁹⁰

The most influential LibQUAL+® articles from the Charlottesville conference were published as a special journal issue of *Performance Measurement and Metrics*.¹⁹¹ This collection of articles demonstrates how LibQUAL+® data can be used for strategic planning and priority setting to inform meaningful actions. The collection places LibQUAL+® as one method that libraries use to improve services across the globe thus complementing other methods for “listening to users.”

¹⁸⁹ Sarah E. Aerni and Donald W. King, “Contingent Valuation of Libraries Including Examples from Academic, Public, and Special Libraries,” 417-424; John T. Snead et al., “Web-Based Evaluation Instructional Systems: Design, Development, Issues, and Considerations,” 425-436; J. Stephen Town, “Value and Impact Measurement: A UK Perspective and Progress Report on a National Programme (VAMP),” 437-448; all in *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007).

¹⁹⁰ Steve Hiller, Kristina Justh, Martha Kyrillidou, and Jim Self, ed., *Proceedings of the 2008 Library Assessment Conference: Building Effective, Sustainable, Practical Assessment, August 4-7, 2008* (Washington, DC: Association of Research Libraries, 2009); Lizabeth A. Wilson, “Seattle to Charlottesville and Back Again: Building a Library Assessment Community,” *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007), 449-463.

¹⁹¹ Martha Kyrillidou, ed., “LibQUAL+® and Beyond: Library Assessment with a Focus on Library Improvement,” *Performance Measurement and Metrics* 9, no. 3 (2008): 157-230.

The first article “Drilling the LibQUAL+® Data for Strategic Planning” by Stewart Saunders comes from Purdue University, located in the heartland of the US, a major land grant university. Purdue integrated LibQUAL+® with their strategic planning process and this narrative describes both the challenges and the opportunities staff encountered during this process. Much like other assessment techniques, LibQUAL+® focuses on where you are now. Understanding and charting where you want to be five years down the road needs to be based on a thorough assessment of the present and built on professional insights, judgments, and collective will about shaping a shared future.¹⁹²

In “Getting Our Priorities in Order: Are Our Service Values in Line with the Communities We Serve?” by Jocelyn Duffy, Damon Jaggars, and Shanna Smith, the authors define ‘priority scores’ for each of the 22 core LibQUAL+® items to examine how well the service priorities of library staff are aligned with the priorities of undergraduates, graduate students, and faculty. The goal is to promote discussion among library staff about users’ needs and how closely staff service priorities align with those needs. Results indicate that service priorities for library staff align

¹⁹² E. Stewart Saunders, “Drilling the LibQUAL+® Data for Strategic Planning,” *Performance Measurement and Metrics* 9, no. 3 (2008): 160-170.

more closely with those of undergraduates than with those of graduate students and faculty. Identifying misalignments can provide useful direction for creating and maintaining service profiles that more closely map to users' stated needs. Currently, we see many libraries reorganizing themselves targeting services to different user groups, undergraduates, graduate students and faculty, based on their priorities.¹⁹³

In "Library Assessment on a Budget: Using Effect Size Meta-Analysis to Get the Most Out of the Library-Related Survey Data Available Across Campus" by Eric Ackerman, the author describes a method that allows one to compare results from different and disparate surveys across campus. Effect size meta-analysis is a statistical method used to combine such disparate results. The method is examined as a practical, sustainable, and effective library assessment technique using data from Radford University. In particular the article demonstrates how one can compare LibQUAL+® survey results with other locally developed surveys, in this case the Radford University Undergraduate Exit surveys. Effect size meta-analysis is an effective way to synthesize data

¹⁹³ Jocelyn S. Duffy, Damon E. Jaggars, and Shanna E. Smith, "Getting our Priorities in Order: Are Our Service Values in Line with the Communities We Serve?" *Performance Measurement and Metrics* 9, no. 3 (2008): 171-191.

from pre-existing library surveys as well as data from non-library-related surveys.¹⁹⁴

In "How You Can Evaluate the Integrity of Your Library Service Quality Assessment Data: Intercontinental LibQUAL+® Analyses Used as Concrete Heuristic Examples" the authors accomplish two purposes: (a) provide practical examples of conducting validity and reliability analysis and (b) explore the validity and reliability of the LibQUAL+® survey scores in British English, Dutch, Swedish, Continental French, German, Norwegian, Finnish and Danish. LibQUAL+® translations are remarkably valid and reliable across all these languages.¹⁹⁵

In "LibQUAL+® (Library Quality), ProSeBiCA (Development of New Library Services by Means of Conjoint Analysis), and CAPM (Comprehensive Access to Printed Materials)" by Sayeed Choudhury, Martha Kyrillidou, Fred Heath, Colleen Cook, Bettina Koeper, and Reinhold Decker, the authors place

¹⁹⁴ Eric Ackerman, "Library Assessment on a Budget: Using Effect Size Meta-analysis to Get the Most Out of the Library-related Survey Data Available Across Campus," *Performance Measurement and Metrics* 9, no. 3 (2008): 192-201.

¹⁹⁵ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "How You Can Evaluate the Integrity of Your Library Service Quality Assessment Data: Intercontinental LibQUAL+® Analyses Used as Concrete Heuristic Examples," *Performance Measurement and Metrics* 9, no. 3 (2008): 202-215.

LibQUAL+® in the context of other assessment efforts that attempt to improve library services.¹⁹⁶

Under the rubric of “Building effective, sustainable, and practical assessment” ARL has engaged in site visits attempting to understand the assessment environment in various libraries. The major lessons learned from this effort and the driving forces of successful assessment stories were documented.¹⁹⁷ “After evaluating results from nearly all participating libraries, two elements emerged as key to effective, sustainable, and practical assessment: (1) library leadership and (2) a library that was customer-centered. Other related issues included aspects of organizational culture, assessment responsibility, link and integration with relations activities, presenting results and acting on results.”¹⁹⁸ The findings are being updated regularly as experience is being built by visiting additional libraries every year. By 2007 “the lack of a

¹⁹⁶ Sayeed Choudhury, Martha Kyrillidou, Fred Heath, Colleen Cook, Bettina Koeper, and Reinhold Decker, “LibQUAL+® (library quality), ProSeBiCA (development of new library services by means of conjoint analysis), and CAPM (comprehensive access to printed materials),” *Performance Measurement and Metrics* 9, no. 3 (2008): 216-222.

¹⁹⁷ Steve Hiller, Martha Kyrillidou, and Jim Self, “Assessment in North American Research Libraries: A Preliminary Report Card,” *Performance Measurement and Metrics* 7 (2006): 100-106.

¹⁹⁸ Steve Hiller, Martha Kyrillidou, and Jim Self, “Keys to Effective, Sustainable, and Practical Assessment,” *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007), 171-176.

coordinated approach to research often results in a plethora of individual research studies, an over-reliance on surveys (especially with the advent of inexpensive Web surveys), and a lack of awareness of assessment activities in the library."¹⁹⁹

Corroborating studies have also looked into the inherent limitations of the traditional library environment when it comes to analytical critical thinking and called for a strengthening of the organizational culture of assessment.²⁰⁰ Based on interviews with over 20 library directors, the latest work by Amos Lakos focuses on the role of leadership in fostering evidence-based decision making in libraries. The author focuses observations on the use of data in decision-making in libraries, specifically on the role of leadership in making evidence-based decision a reality, and reviews new opportunities for data analysis, assessment delivery, and decision-making in libraries.

¹⁹⁹ Steve Hiller, Martha Kyrillidou, and Jim Self, "When the Evidence Isn't Enough: Organizational Factors that Influence Effective, Sustainable and Practical Assessment," *Performance Measurement and Metrics* 9, no. 3 (2008): 223-230; originally presented at EBLIP4, Durham, North Carolina, May 7, 2007, <http://www.libqual.org/documents/admin/Hiller2.pdf>.

²⁰⁰ Susan Beck and Wanda Dole, "Data Policy Action: The Continuous Improvement Cycle--Cases from ARL and Carnegie MA I Libraries," *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007), 139-158; Amos Lakos, "Evidence-Based Library Management: A View to the Future," *Proceedings of the Library Assessment Conference: Building Effective, Sustainable and Practical Assessment, September 25-27, 2006* (Washington, DC: Association of Research Libraries, 2007), 159-170.

Developments in the information technology (IT) area, especially the increased dominance of very large networked infrastructures and associated services, large-scale digitization projects, collaborative frameworks, and economic and market trends, may have a positive impact on library options for data use and analysis by library management.²⁰¹

Where Next?

James Neal documents the plight of the field:

"Librarianship is an 'information poor' information profession. Decisions are routinely not supported by the evidence of well-designed investigations. Research in the field is poorly communicated, understood, and applied. It is imperative that academic librarians and higher education libraries develop and carry out systematic research and development programs."²⁰² He lays the challenge for continued commitment to research and development capacity so that decisions are based more on facts and less on opinion.

²⁰¹ Amos Lakos, "Evidence-Based Library Management: The Leadership Challenge," *portal: Libraries and the Academy* 7 (October 2007): 431-450.

²⁰² James G. Neal, "The Research and Development Imperative in the Academic Library: Path to the Future," *Libraries and the Academy* 6 (2006): 1.

Measuring library service quality across institutions leads to the issue of whether improvements of library services can be facilitated by greater collaboration and resource sharing. Users' expectations of library service across the globe are converging as they want to access seamlessly all information resources they need, irrespective of location. Can this translate into a successful implementation of universal and local standards for the provision of library services?²⁰³ What levels of standard need to be applied to different types of educational institutions across the globe to harmonize and manage the expectations of library users for the benefit of improving research, teaching, and learning? Are there service attitudes that are specific to the different cultures, what might they be, and how can this knowledge be leveraged for providing excellent library services? How would these concepts be translated into library policies and procedures that can meet local needs, yet help establish and manage expectations of delivering quality library services across institutional and political boundaries?

²⁰³ Martha Kyrillidou, "Service Quality: A Perceived Outcome for Libraries," in *Revisiting Outcomes Assessment in Higher Education*, ed. P. Herson, R. E. Dugan, and C. Schwartz (Westport and London: Libraries Unlimited, 2006), 331-366.

Sustaining a robust R&D capacity and advocating the value of library services will remain an ongoing challenge as we are being called to answer challenging and exciting questions in the years to come. LibQUAL+® has been a vital step forward in this process and in many ways is emerging as the 21st century version of the Gerould Statistics.²⁰⁴ Much like Gerould started collecting systematically input statistics for describing research libraries in 1908, LibQUAL+® in the beginning of the 21st century is systematically collecting data on library user perceptions and expectations. Gerould Statistics, and their antecedent ARL Statistics, defined in descriptive and cultural terms what academic libraries looked like in the 20th century. LibQUAL+® is defining the same key elements of what academic libraries look like in the 21st century: personal touch by trained professionals (Affect of Service), access to information when needed and in whatever form is desirable (Information Control), and a physical or virtual space where the mind and/or body can enjoy and process information and knowledge (Library as Place). Collaborative assessment based on sound research and methodological principles with technological insights are proving to be

²⁰⁴ Martha Kyrillidou and Colleen Cook, "The Evolution of Measurement and Evaluation of Libraries: A Perspective from the Association of Research Libraries," *Library Trends* 56, no. 4 (2008): 888-909.

sound ways for libraries to improve services and supplement intuition and experience.

CHAPTER 3. METHODS

Survey researchers often develop item pools of large numbers of questions. In general survey length contributes to respondent burden and can affect response rates and participation. Surveys and tests can be rather expensive to develop and administer both from a designer perspective and from a respondent perspective in terms of the time it takes to fill in a survey.

From 2000 to 2008, there were 1,781 LibQUAL+® surveys implemented collecting completed surveys from 1,047,569 respondents (Figure 4). The median time for completing a LibQUAL+® survey is 8 minutes, which translates to a total of 5,820 days for all surveys submitted since inception, or almost 16 years, spent by all the respondents across all these institutions from 2000 to 2008. Clearly, any improvements in reducing respondent burden would be of great benefit to both libraries and respondents.

Matrix sampling has been developed to collect data for all survey items but minimize the respondent burden in terms of the number of items a respondent has to answer. In response to requests to reduce respondent burden matrix sampling was

applied in developing a LibQUAL+® Lite pilot where every person is presented with a different and smaller number of items from the larger item pool. In particular:

LibQUAL+® Lite is a survey methodology in which (a) all users answer a few, selected survey questions (i.e., three core items), but (b) the remaining survey questions are answered ONLY by a randomly-selected subsample of the users. Thus, (a) data are collected on all questions, but (b) each user answers fewer questions, thus shortening the required response time. The following graphic illustrates this survey strategy. In this example, all users complete three of the items (i.e., the first, second, and fourth items). But only Mary and Sue were randomly selected to complete the third item in the item pool, which was Service Affect item #2. Only Bob and Mary were randomly selected to complete the fifth item in the item pool, which was Service Affect item #3. Only Sue and Ted were randomly selected to complete the sixth item in the item pool, which was Information Control item #2.

On LibQUAL+® Lite, each participant completes only eight of the twenty-two core survey items. Every participant completes the same single Service Affect, single Information Control, and single Library as Place items, plus two of the remaining eight (i.e., nine - the one core item completed by everyone) randomly-selected Service Affect items, two of the remaining seven (i.e., eight - the one core item completed by everyone) randomly-selected Information Control, and one of the remaining four (i.e., five - the one core item completed by everyone) randomly-selected Library as Place items.²⁰⁵

²⁰⁵ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example," *Performance Measurement and Metrics* 1 (2009): 6-16.

	Person				
Item	Bob	Mary	Bill	Sue	Ted
Affect of Service #1	X	X	X	X	X
Information Control #1	X	X	X	X	X
Affect of Service #2		X		X	
Library as Place #1	X	X	X	X	X
Affect of Service #3	X	X			
Information Control #2				X	X
Library as Place #2			X	X	

Note. Items completed by all participants are presented in **bold**.

A comparison of the full version of LibQUAL+® and the Lite version is included in Appendix A. The Lite protocol as described in Appendix A has three linking items that are constant. The rest of the items are designated in dimension slots defined with one time randomization. Each dimension slot item is randomly selected from the remaining items for this dimension. The three linking items allow us to develop score equivalencies between the long and the Lite version of the protocol if there are differences in the scores between

these two protocols. These items were selected based on the highest factor pattern coefficients they have on their respective dimension (or factor).²⁰⁶

In implementing the LibQUAL+® Lite protocol each institution has the ability to customize the survey in a number of different ways and in relation to what is of interest in the current study, each institution has the ability to define the percent of 'Lite' views generated from the system randomly. Figure 5 shows a screen shot from the online web interface where the percent of Lite views is defined by the library.

Institutions were recruited to participate in the pilot and the beta when we announced the availability of a testing environment in January 2008. We worked closely with interested institutions. We recruited institutions to do sample walk throughs and we recruited institutions to implement the actual survey. The institutions that implemented the actual survey had to invite their students and/or faculty by sending email invitations to a random sample, or a population, in a similar way they typically invite participants for the regular LibQUAL+® survey. The

²⁰⁶ Bruce Thompson, *Exploratory and Confirmatory Factor Analysis: Understanding Concepts and Applications* (Washington, DC: American Psychological Association, 2004).

following institutions are analyzed for the Pilot and the Beta phases:

<i>Pilot</i>	<i>Beta</i>
University of Alberta Libraries	University of Arizona
Arizona State University Libraries	<i>Belmont Technical College Learning Resource Center</i>
University of North Texas	University of Central Florida
Texas A&M University Libraries	University of Glasgow Library (UK)
	Illinois Institute of Technology
	<i>Lorain Community College</i>
	Oklahoma State University
	Point Park University
	Radford University
	University of Haifa (Israel)
NOTE: Bold indicates ARL member library	

There were three ARL member libraries and one non-ARL institution in the Pilot phase. All institutions implemented the American English University version of the survey.

There was a total of ten institutions that collected data from their users during the Beta phase; there were two ARL member libraries, two community colleges, an institution from the UK and one from Israel among others. All North American based institutions implemented the American English version of the survey and the UK based institution implemented the British English version of the survey. The University of Haifa implemented the survey in Hebrew with a parallel British English version running for those who do not speak Hebrew. Eight institutions implemented the College and

University version and the two community colleges implemented the community college version of the survey.

Note that the 22 core questions are translated across all language versions; there is some variation in the demographics categories across languages and types of institutions (university vs community college). The community college user groups are different from the university college groups.

The current study is an experiment (or randomized control trial). Because the participants are randomly assigned the long or the Lite form, it is expected that any differences in the scores will be the result solely of the changes in the length of the protocol.

In this study we are exploring (a) participation rates, (b) completion times, and (c) result comparison across the two protocols at each of ten institutions that participated in the LibQUAL+® Beta phase. We want to find out whether the LibQUAL+® Beta results are comparable to the LibQUAL+® Pilot phase and also whether there are differences in the long and Lite versions of the protocol among different user groups (undergraduates, graduate students and faculty).

In particular we are answering six different research questions with a variety of analytical methods as described below:

1. How much do participation rates differ between the long and the Lite version of the LibQUAL+® protocol? Research question one compares the participation rates between the long and the Lite version of the protocol by examining descriptive statistics like the percent of surveys completed in each institution when respondents are presented the full version vs the Lite version of the protocol across ten different institutions that participated in the LibQUAL+® Beta phase. We anticipate that a higher percent of participation occurs with the LibQUAL+® Lite version of the survey comparable to the earlier findings of the LibQUAL+® Pilot phase.

We also examine the proportion of comments provided by respondents when presented with the Lite and the full version to determine whether there are differences in participation rates regarding the submission of comments. Results from the pilot phase indicate that a higher percent than expected responded to the Lite form. We also examined the percentage of participants who (a) completed the survey

and (b) met the inclusion criteria across institutions. Data from the pilot phase indicate that in all cases a higher percentage of inclusion occurs when respondents are presented with the Lite form.

2. How much do completion times differ between the long and the Lite version of the protocol? Research question two compares the completion times in terms of seconds between the long and the Lite version of the protocol by examining descriptive statistics like the median response time in seconds. We expect shorter response times for the LibQUAL+® Lite version and results comparable to the earlier findings of the LibQUAL+® Pilot phase. Data from the pilot phase indicate that completion time is only 285 seconds on average for the Lite form as opposed to 470.5 seconds for the long form.

3. Are the perception scores on the LibQUAL+® overall score, the three dimension scores (Affect of Service, Information Control and Library as Place), as well as the three linking items the same between the long and the Lite version of the protocol?

Using the Excel Chart Builder Stock template we will present graphically the differences between the Lite form and the long form with 95% confidence intervals around the perception means of the three dimensions for all the participating institutions. We expect the scores to be slightly lower in the Lite form for all participating institutions similar to the findings reported in the Pilot phase.

4. Are the scores on the total, subscale and linking item scores the same between the long and the Lite version of the protocol for each one of the 14 participating libraries?

Research questions 3 and 4 are analyzed utilizing one way analysis of variance comparing the mean scores on the LibQUAL+® survey between the long and the Lite version of the survey. Because the items are randomly assigned on the LibQUAL+® Lite protocol, we would expect that any differences in the scores between the long and the Lite version are due to real differences in scores between the long and the Lite version of the protocol. We expect that the scores will be slightly lower on the LibQUAL+® Lite version for the Information Control and Library as Place

dimension and linking items replicating findings uncovered in the Pilot phase.

One way analysis of variance will determine whether the scores are different between the long and the Lite version of the protocol within each institution. Using the results of the analysis of variance 95% confidence intervals are constructed for perception scores on the overall rating, the three dimension scores, and the three linking items between the long and the Lite version of the protocol. The goal is to determine whether differences are important enough to warrant adjusting the scores between the two protocols.

5. Are the perception scores on the overall, the three dimensions and the three linking items the same between the long and the Lite version of the protocol **within** each user group (undergraduates, graduate students, and faculty) across all participating institutions? Two way analysis of variance will be used to determine whether two between-subject factors, (a) user group (undergraduates, graduate students and faculty) and (b) the version of the protocol (full or Lite) produce differences in the scores. Seven two-way analysis of variance models were implemented for

the seven dependent variables: (1) overall library service quality perception score, (2) Affect of Service perception score, (3) Information Control perception score, (4) Library as Place perception score, (5) scores on the linking item measuring the Affect of Service dimension, (6) scores on the linking item measuring the Information Control dimension, and (7) scores on the linking item measuring the Library as Place dimension.

6. If there are score differences what are the adjustments we need to implement to convert scores from one version of the protocol to the other (long form scores to Lite ones and Lite form scores to the long form)?

If there are differences between the two forms, there are ways to develop adjustments to the scores using formulas for producing score equivalencies (see Appendix D). "There are various ways that linking items can be used to equate scores across alternative test forms. The alternatives vary in their tradeoffs of simplicity against precision, and with respect to what statistical assumptions one wants to make."²⁰⁷

²⁰⁷ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "Equating Scores on "Lite" and Long Library User Survey Forms: The LibQUAL+® Lite Randomized Control Trials," *Performance Measurement and Metrics* (in press).

For example, a simple formula²⁰⁸ was used to calculate score equivalencies with the pilot LibQUAL+® Lite data based on the linking items and summary statistics from four pilot institutions.

(a1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form, the following formula was used:

$$\text{LITE}\underline{X}_{ij} = \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])$$

where:

$\text{LONG}\underline{X}_{ij}$ = the score (e.g., 6.00, 7.00) of a given ith person, on any one given jth item (e.g., IC02, IC05, IC07), from a given subscale (e.g., Information Control, Library as Place), on the **long** protocol.

$\text{LONG}\underline{M}_L$ = the mean on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{M}_L$ = the mean on the **Lite** form on the linking item for a given subscale.

$\text{LONG}\underline{SD}_L$ = the standard deviation on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{SD}_L$ = the standard deviation on the **Lite** form on the linking item for a given subscale.

²⁰⁸ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example," *Performance Measurement and Metrics* 1 (2009): 6-16.

(a2) for converting Lite form scores into long form scores the formula is:

$$\text{LONG}\underline{X}_{ij} = \text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L])$$

This formula assumes for example that there are not major differences in the standard deviation between long and Lite versions for the items converted and the linking items for a given subscale and uses the ratio of the standard deviations in the linking items.

A more sophisticated formula would take into account and adjust for differences in the standard deviation between long and Lite versions for the items converted. In another study using data from the University of Haifa a more sophisticated approach was presented using a different formula.²⁰⁹

(b1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form, we can use the formula:

$$\text{LITE}\underline{X}_{ij} = [([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_j] / \text{LONG}\underline{SD}_j) * (\text{LONG}\underline{SD}_j * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])] + [\text{LONG}\underline{M}_j - (\text{LONG}\underline{M}_L - \text{LITE}\underline{M}_L)]$$

²⁰⁹ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "Equating Scores on "Lite" and Long Library User Survey Forms: The LibQUAL+® Lite Randomized Control Trials," *Performance Measurement and Metrics* (in press).

(b2) Conversely, if we wanted to equate a score on the Lite protocol, on item jth with a score on the long protocol, we could use the formula:

$$\text{LONG}\underline{X}_{ij} = [([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_j] / \text{LITE}\underline{SD}_j) * (\text{LITE}\underline{SD}_j * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L])] + [\text{LITE}\underline{M}_j - (\text{LITE}\underline{M}_L - \text{LONG}\underline{M}_L)]$$

There are truly multiple ways of linking items and one can thoroughly investigate the subject in additional ways.²¹⁰ For the purposes of this study we provide relevant recommendations regarding the two approaches published in the literature and discuss their implications in subsequent chapters and in Appendix D.

Summary

The methods primarily utilized include: exploratory descriptive statistics, one way and two way analysis of variance. Comparisons of mean scores with construction of confidence intervals and examination of effect sizes will be presented systematically. These comparisons are done within institutions when possible and across institutions to determine whether differences between the means produced

²¹⁰ Linda Crocker and James Algina, *Introduction to Classical and Modern Test Theory* (New York: CBS College Publishing, 1986); Michael J. Kolen and Robert L. Brennan, *Test Equating, Scaling, and Linking: Methods and Practices* (2nd ed.) (New York: Springer, 2004).

for characteristics of the survey protocol such as versioning (long vs Lite) and user group characteristics (undergraduates, graduate students and faculty) are important. Score adjustment methods to equate scores between the long and the Lite version of the protocol are also presented and discussed.

CHAPTER 4. FINDINGS AND DISCUSSION

Introduction

In this chapter, the findings are presented for all research questions outlined in Chapter 3. The goal is to determine whether there are distinct benefits in using the Lite form and what these are, or whether it does not make any difference whether a library uses the long or the Lite form. The analysis focuses on potential benefits in terms of participation rates, response time, and differences between the long and the Lite score forms regarding respondents' scores.

In particular, research questions focus on whether the Lite form demonstrates benefits such as (1) improved participation rates and (2) improved response times. Analysis is presented as to whether there are differences in the scores between the long and the Lite form for the overall total score, the three dimension scores, and the three linking items. The scores are analyzed for differences between the Lite and long form across all institutions and within each institution. Differences are evaluated based on effect size statistics. The scores are also analyzed across different user groups (undergraduate

students, graduate students, and faculty) for the college/university library type. Analysis is performed on whether certain user groups are responding differently in the long versus the Lite form. Last, two alternative approaches for score conversion are discussed and their pros and cons presented for those situations where it is deemed important to convert long form scores to Lite form scores or Lite form scores into long form scores.

Description of the data

The final sample included data from 14 institutions from both the pilot and beta phase and 10,777 survey respondents. For the purposes of the analysis presented here the institutions have been assigned letters of the alphabet from A to N. The order of the assigned letters was based on the sum of differences between long and Lite surveys on the three linking items (one for each dimension: Affect of Service, Information Control and Library as Place).

Thus, the institutions in the beginning of the alphabet are those with the larger sum of the differences in the scores between long and Lite form for the three linking items and those at the bottom with the smaller sum of the

differences. The four institutions in the beginning of the alphabet are large research libraries (three are US ARL libraries and one is from the UK). Institutions A and B have implemented LibQUAL+® every year since 2000. Institution C implemented LibQUAL+® six times since 2003. Institution D implemented LibQUAL+® twice between 2001 and 2008. Institutions B, F, G, and K are the four pilot institutions;²¹¹ the rest are from the beta phase. The number of respondents at the different institutions varied from a high of 2,536 (institution G) to a low of 251 (institution M) respondents.

Table 1 summarizes the distribution of the respondents by institution and by long and Lite survey form showing the number of respondents contributed by each institution for the purposes of this study. It includes institutions from both the pilot and the beta phase. There were 6,572 Lite surveys and 4,205 long ones. The highest number of Lite form surveys per institution was 1,868 (28.42 percent of all Lite forms) and the lowest 69 (1.05 percent); similarly, the highest number of long form surveys was 819

²¹¹ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example," *Performance Measurement and Metrics* 1 (2009): 6-16.

(19.48 percent of all long forms) and the lowest 99 (2.35 percent).

Some institutions collected surveys from faculty, students, and staff. Others collected data only from one user group. The two community colleges have only two external user group categories (faculty and students) while college/university type libraries have three external user group categories (undergraduate students, graduate students, and faculty).

Results are based on the number of valid cases after the screening criteria for determining valid cases are applied to all complete and incomplete surveys captured. Complete surveys are those where people fill in all the survey items without leaving any blank items. If someone leaves a question unanswered the system prompts them to respond to it after capturing the data they have filled in. So, the system may capture incomplete surveys as long as the submit button has been pressed. The captured data may meet the screening criteria for inclusion into the analysis. So, even if a survey is not 'complete' it may be determined to

have adequate information for including it in the analysis.²¹²

From all four institutions in the pilot phase the highest number of valid cases was 2,536 (institution G) and the highest number of valid cases from an institution in the beta phase was 1,909 (institution H). The lowest number was 691 (institution F) for the pilot and 251 (institution M) for the beta phase.

The highest number for the Lite protocol was 1,868 (institution G) and the lowest 69 (institution I). The highest number for the long protocol was 819 (institution H) and the lowest 99 (institution M).

The percent of Lite surveys completed in the participating institutions varied from 76.8 to 23.1. The random percent set for receiving the Lite protocol varied from 20 to 70.

Research Question 1 - Participation Rates

The first research question asked how much do participation rates differ between the long and the Lite version of the

²¹² The screening criteria for inclusion in the analysis for long surveys are: (a) complete data on the 22 items (or the 8 items for Lite surveys) and where respondents chose a “user group,” (b) no more than 11 N/A (4 N/A for Lite), and (c) no more than 9 logical inconsistencies (3 for Lite) where desired lower than minimum expectations.

LibQUAL+® protocol? The difference in the percent between the random percent set and the actual percent of Lite surveys received indicates that in all cases the Lite form received higher participation rates. If there was no difference in the way people respond to the Lite form we would expect the actual percent to be the same as the random percent since all other variables between long and Lite form were the same and users were randomly presented with the long or the Lite form.

The random percent setting determines the percent of Lite random surveys out of the total number of surveys that a library is requesting from the system to present to their users. During the pilot phase three institutions set the random percent to 50 percent and one to 70 percent. During the beta phase there were two institutions out of 10 that deviated from the 50 percent setting, with one institution setting the random percent to 20 and another one to 70 percent. In all cases the Actual percent of Lite surveys completed was higher thus confirming the finding that more people respond to the Lite form.

Participation rates are improved with the Lite protocol ranging from 10.6 to 3.1 percent higher participation

across both pilot and beta institutions. The range of the difference was between 3.7 and 9.5 percent for the four pilot institutions and between 3.1 and 10.6 percent for the ten beta institutions.

Table 2 summarizes the percentage of participants who (a) completed the survey and (b) met inclusion criteria across institutions and administration formats. In other words, the table presents the percent of people who completed the long form out of the total number of people presented with the long form. Similarly, the percentage of participants who completed the Lite form out of all the people presented with the Lite form. For every institution that participated in the pilot and the beta phase the percentage of participants who completed the Lite form is higher than the percentage of participants who completed the long form. The percentages vary from a low of 30 percent to a high of 61.4 percent for the long form across both pilot and beta institutions and between 41.2 to 73.6 percent for the Lite form. Overall, out of the 10,032 people presented with the long form, there were 4,205 valid respondents (41.9 percent). Whereas, out of the 11,952 people presented with the Lite form, there were 6,572 valid respondents (55 percent). This is a gain of 13 percent more people

responding to the Lite form. This gain varies from a low of 7.5 to a high of 16.7 percent for different institutions.

There are a number of distinct benefits in having a larger proportion of participants responding to a survey. All things being equal with a larger number of respondents it is more likely that the data are more representative while minimizing non-response bias.

Another benefit is the ability to analyze the data at greater levels of granularity regarding user group categories and disciplines. The larger the number of respondents the more likely estimated statistics for the different subgroups are representative of population estimates. This allows libraries to track levels of perceived service quality across different departments, disciplines and user group categories providing targets for improvement at granular levels useful for management purposes.

In addition to the ability to analyze the quantitative data more in depth through disaggregating, libraries also receive an increased number of comments from the Lite survey protocol because of increased responses. Table 3

summarizes the number of comments provided by long and Lite forms. Overall, there were a total of 4,485 surveys with comments (1,747 from the long form and 2,738 from the Lite form). Proportionately 61 percent of the comments are from Lite forms and 39 percent from long forms. There were more comments from Lite surveys because there were more Lite surveys. When examining the proportion of surveys providing comments as a percent of all long form and Lite form surveys, there is no advantage in getting proportionally more comments from the Lite form above and beyond the increased proportion of Lite forms received. Across both long and Lite forms 42 percent are providing comments (1,747 out of 4,205 for long and 2,738 out of 6,572 for Lite). Half of the institutions received slightly more comments proportionately on the Lite forms and half of them received slightly more comments on the long form ending in 0 percent difference.

**Research question 2 - How much Do Completion Times Differ
Between the Long and the Lite Version of the Protocol?**

In presenting the data for completion times the information is summarized in seconds. Outliers were eliminated if they took less than two minutes (120 seconds) to respond to the

survey or if they took more than two hours (7200 seconds). It is conceivable that someone attempts to access the survey and because of interruptions does not submit the survey until days later. For example, there was an outlier of 94 hours in one institution and another one of 25 hours in another one. There were a total of 176 outliers out of a total of 10,457²¹³ respondents who took either less than 2 minutes or more than two hours to fill in the survey. Even though the median is not affected considerably (median = 375 seconds when including the outliers and 376 seconds when outliers are excluded) eliminating the outliers results in a more robust and trustworthy figure for the mean (M = 770 seconds including the outliers and M = 512 seconds when excluding the outliers) and standard deviation (SD = 5,817 including the outliers and SD = 552 when excluding the outliers).

Overall, it took a mean 418 (SD = 480) and median 302 seconds to complete the Lite version (Table 4) and a mean of 659 (SD = 621) and a median of 507 seconds to complete the long version (Table 5). This is a difference of 241

²¹³ Note that this is slightly less than the 10,777 respondents reported in Tables 1 and 2 because it excludes administrative and library staff respondents. The 10,457 respondents are undergraduates, graduate students and faculty only.

seconds for the mean (4.01 minutes) and 205 seconds (3.41 minutes) for the median.

Completion times are improved with the Lite version of the protocol across the board ranging from a low median of 142 seconds gain (institution M) to a high median of 239 seconds (institution N) between the long and the Lite form across the 14 institutions participating in the pilot and beta phases. Similarly the range of improvement for the mean difference varies between 90 (institution M) and 290 seconds (institution D).

The benefits in saving respondent time are considerable given that LibQUAL+® administration ranges from a low of 170 to a high of 250 institutions receiving valid data from anywhere between 160,000 to 260,000 respondents on an annual basis. In practical terms, this would translate to savings ranging from 38,509,824 to 62,578,463 seconds, or 641,830 to 1,042,974 minutes, or 10,697 to 17,384 hours, or 446 to 724 days, or 1.22 to 1.98 years across respondents. LibQUAL+® Lite is clearly a remarkable improvement in terms of both time efficiency and maximizing the value of respondents' time.

Do these efficiencies translate in other differences regarding the total, dimension and linking items scores? Are the scores across long and Lite form the same or are there differences and in what direction? How important are these differences?

Research Question 3 - Score Differences (All Respondents)

The third research question asked whether there are differences on the LibQUAL+® overall score, the three dimension scores (Affect of Service, Information Control and Library as Place), as well as for the three linking items between the long and the Lite version of the protocol.

One way analysis of variance was performed on the combined Pilot and Beta data (Table 6) for total, dimension and linking items scores (seven ANOVAs). Both $p_{\text{CALCULATED}}$ and eta squared effect sizes are reported. Statistical significance p values are largely driven by sample sizes, and any nonzero effect size will become significant at some sample size. As Bruce Thompson noted in a 1992 article:

Statistical significance testing can involve a tautological logic in which tired researchers, having collected data from hundreds of

subjects [nowadays instead called "participants"], then conduct a statistical test to evaluate whether there were a lot of subjects, which the researchers already know, because they collected the data and know they're tired.²¹⁴

Thompson more recently noted, "In part, statistical significance tests evaluate whether researchers are ambitious regarding sample size, or lazy. Would we rather know about the personality of the researcher (e.g., drive, ambition), or (a) the effect size magnitude and (b) the replicability of the research results?"²¹⁵

Overall, there are statistically significant differences between the long and the Lite versions but the effect size statistics are small. The ANOVA effect size statistic reported is η^2 also called the correlation ratio which is an uncorrected variance-accounted for effect size analogous to r^2 or R^2 .

In particular, the total LibQUAL+® score, the Information Control and Library as Place subscale scores and the Information Control and Library as Place linking item scores show a statistically significant difference between

²¹⁴ Bruce Thompson, "Two and One-Half Decades of Leadership in Measurement and Evaluation," *Journal of Counseling and Development*, 70 (1992): 434-438.

²¹⁵ Bruce Thompson, *Foundations of Behavioral Statistics: An Insight-Based Approach* (New York: The Guilford Press, 2006): 177.

the long and the Lite version. The Lite form scores are slightly lower in all these cases. The Affect of Service subscale and linking item scores do not show a statistically significant difference between the long and the Lite form.

In other words there is a small systematic difference between the long and the Lite form with the Lite scores being consistently slightly lower in particular for the total score, the Information Control and Library As Place subscale and linking items. Statistical significance is not a very meaningful indicator of importance though when there are large sample sizes like the sample size analyzed in this study ($n > 10,000$ cases). In summary, this observed and small but systematic difference is not important given the effect size statistics that are generally very small ($\eta^2 \leq 1.16$ percent).

As reflected in Table 6 η^2 effect sizes, there was little difference between means on the long and the Lite form for all examined scores. The largest effect size is 1.16 percent for the Information Control linking item (The electronic information resources I need). Despite statistically significant p values ($\alpha = .05$) for total

scores, Information Control and Library as Place subscale and linking items scores, the low effect sizes indicate there was little, if any, practical difference between responses in the long and Lite forms.

Research Question 4 - Score Differences (Institutional Results)

The fourth question asked whether the overall findings described in research question 3 are replicated when the analysis is performed within each institution. Are the scores on the total, subscale and linking item scores the same between the long and the Lite version of the protocol in each of the 14 participating libraries?

When doing the same analysis across all the institutions (Tables 7 to 20) the same general pattern that appears in the overall results replicates for some of the findings but not consistently. For example, the total score is statistically significant only in three out of the 14 institutions ($p < .05$ for institutions A and B and $p < .001$ for institution H). Similarly, the Information Control and Library as Place dimension and linking items scores are not consistently statistically significantly different across

all the institutions. In one rare occasion the Affect of Service linking item score is statistically significantly different (institution B). The small differences observed in the Information Control and Library as Place subscale and linking items scores have small effect size statistics. In general the effect size statistics are very small and the evidence indicates that these differences are not of practical importance for the most part.

Using the results of the analysis of variance 95% confidence intervals were constructed for perception scores on the overall rating (Figure 6), the three dimension scores (Figures 7 to 9), and the three linking items between the long and the Lite version of the protocol (Figures 10 to 12) with the Excel Chart Builder Stock template. As described through the tables, the scores were slightly lower in the Lite form for all participating institutions on these charts. The Y axis is the same across all these figures so results can be compared not only within each dimension and items but also across the different figures.

In general the well-known pattern of the Library as Place dimension having the lowest scores replicates across the

different institutions. The Information Control dimension tends to be the one with the higher scores.

In reviewing these differences graphically in the figures provided the conclusion tends to be the same as the one derived from the examination of the ANOVA tables. There are slight differences between the long and the Lite form in that the Lite form produces slightly lower scores for the Information Control and Library as Place concepts in particular. These differences are small.

The fact that for the most part these small differences are in the direction of Lite producing slightly lower scores, one may argue that the Lite form produces slightly more accurate estimates of the population statistics for these concepts because the response rate is slightly higher for the Lite form. Given that Lite forms have higher participation and significantly lower completion times than the long forms, Lite is advantageous and the preferred form to implement.

Research Question 5 - Score Differences for User Group Categories

Research question five asked whether the scores on the overall, the three dimensions and the three linking items

are the same between the long and the Lite version of the protocol **within** each user group (undergraduates, graduates, and faculty) across all participating institutions?

There were a total of 12 participating institutions that fell into the category of university/college type where the position code has three basic groups: undergraduate students, graduate students and faculty. Two of the institutions are community colleges having different position groups (students and faculty) and are not included in this part of the analysis.

An aggregate analysis across all university/college type institutions is presented in Table 21 that summarizes seven sets of 2-way factorial ANOVAs. A 2-way factorial ANOVA has two independent variables (User Group and Lite for the purposes of the current study) and a dependent variable (total score, subscale and linking items scores for the purposes of this study). Thus seven 2-way factorial ANOVAs are summarized in Table 21.

A 2-way factorial ANOVA examines differences in main and interaction effects, i.e. whether the means on the dependent variable are the same across the different

categories of the independent variables (main effects) and whether the dependent variable behaves differently under different combination of the categories of the independent variables (interaction effects). It is a very useful procedure when both independent variables can be controlled or changed. In our case, the user group is a status category that cannot be changed but we are interested as to whether the Lite form behaves differently for any one of these user group categories and in what way. The findings provide insights as to whether implementing Lite produces results that are the same across all three user groups.

The designs are 3 X 2 2-way ANOVAs. The user group variable has three categories: undergraduate students, graduate students and faculty; the Lite variable is binary (yes/no).

Given the large sample size and the high probability of detecting statistically significant results, it should not be surprising that many of the results are statistically significant. User group main effects are statistically significant for all dependent variables, Lite main effects are statistically significant for total score, Information Control and Library as Place subscale and linking items, and interaction effects are statistically significant ($p <$

.05) for Information Control and Library as Place subscale items and only the Information Control linking item. However, effect size statistics are very small in all these cases indicating that there is little practical significance in these observed differences.

Table 22 presents means and standard deviations for all the combinations of categories analyzed in the seven 2-way factorial ANOVAs. These cell means are "impacted by the confounding joint influences of a variety of factors. As noted by Rosnow and Rosenthal (1989a), the cell means 'are the combined effects of the interaction, the row effects [a main effect], the column effects [a second main effect], and the grand mean' (p. 144) ... Interaction effects can correctly be explored by plotting (or analyzing) corrected or adjusted means, rather than the actual cell means."²¹⁶

Adjusted means were calculated for all seven dependent variables for the combinations of user group and Lite categories and plotted as shown in Figures 13 to 19. Effect sizes are small and while avoiding over interpreting the

²¹⁶ Bruce Thompson, *Foundations of Behavior Statistics: An Insight-Based Approach* (New York: The Guilford Press, 2006), 341-342.

observed interactions, the following observations are offered based on the interaction plots of adjusted means.

Regarding LibQUAL+® total scores, faculty rate the library slightly higher than undergraduate and graduate students on the long form and slightly lower than graduate students and undergraduates on the Lite form; graduate students have the lowest total score on the long form compared to the other two user groups and the highest on the Lite form.

A similar pattern is observed regarding the Affect of Service and Information Control subscale interaction effects. In observing the Library as Place subscale interaction effect, graduate students behave exactly the same as undergraduate students with no noticeable difference between the two forms, whereas faculty still have higher scores on the long form and lower scores on the Lite form compared to the other groups.

In examining the interaction effects of the Affect of Service linking item, undergraduate students have the highest scores on that item on the long form and the lowest on the Lite form and graduate students the lowest on the long form and the highest on the Long form. On the

Information Control linking item, graduate students have the lowest score on the long and the highest on the Lite; both undergraduate students and faculty have higher scores on the long form and lower scores on the Lite form with undergraduates having slightly higher scores than faculty on this item. On the Library as Place linking item, graduate students and undergraduates are almost the same on both long and Lite forms, whereas faculty have the highest scores on the long form and the lowest on the Lite form.

Though not of significance necessarily in affecting our treatment of scores since the differences are not important and have small effect size statistics, these scores provide useful insights regarding how user groups perceive Affect of Service, Information Control and Library as Place in relation to long and Lite forms.

Graduate students behave more like undergraduates when it comes to Library as Place. Graduate students show similar patterns when it comes to Affect of Service and Information Control (lowest on the long form and highest on the Lite form).

Undergraduate students tend to show the smallest amount of difference between the long and Lite forms from the three user groups. The differences are minimal in the subscale scores and the Library as Place linking item, and slightly more pronounced in the Affect of Service and Information Control linking items.

Faculty show consistently lower scores on the Lite forms for total, subscale and Information Control and Library as Place linking items. A notable exception is the Affect of Service linking item where they score slightly lower on the long form and higher on the Lite form.

In summary these differences are of limited practical significance when it comes to determining the need to adjust scores between long the Lite forms. In adjusting scores, there is no need to consider user group characteristics based on the evidence collected in this study.

A brief examination of differences in scores between long and Lite form was also done regarding discipline categories. The differences there are also very small (see Table 23). The direction of the difference tends to be

slightly higher scores in the Information Control and Library as Place area and slightly lower scores in the Affect of Service item for the Lite form across different disciplines.

Research question 6 - Score Adjustments

If there were a need to adjust for score differences what are the adjustments we would implement to convert scores from one version of the protocol to the other (long form scores to Lite ones and Lite form scores to the long form)?

Given the current findings, it is questionable whether score adjustment is necessary. In answering the question whether it is important to adjust the scores between the two protocols, the answer is no based on the evidence presented so far. Most of the time it seems unnecessary to adjust scores given that the differences are relatively small and of limited practical importance (very small effect size statistics).

The results suggest that both forms can be administered to random sample splits and Lite form results can reasonably be aggregated with long form results to get the most data on a specific item or dimension.

Still it is useful to outline a couple of different ways one may go about equating scores for those rare occasions where there is an important difference or a methodologically purist approach to LibQUAL+® scoring procedures is needed. So, based on practical or political considerations one may consider a variety of issues and a couple of alternatives in adjusting scores between the long and the Lite protocols.

Under what circumstances may one consider equating scores from different administrations?

Equating scores from Lite to long and long to Lite may be a useful consideration for large research libraries that have used the long protocol on an annual or biennial basis in the past. These libraries track trends over time systematically and making adjustments for increased precision in the comparability of the results over time may be useful. Once there is a baseline for converting scores though it is highly recommended that libraries consistently implement the Lite form.

In particular institutions A and B that are the two institutions that have the largest sum of differences between the long and the Lite version when summing differences across the three dimensions, are among the handful of institutions that have implemented LibQUAL+® annually. These two institutions as opposed to the rest of the institutions participating in the LibQUAL+® Lite experiment had the largest difference between the long and the Lite versions. These institutions would benefit the most from implementing the Lite version but they would also consider more seriously than the rest of the group whether they need to apply a score adjustment equation.

Long forms may be useful in rare occasions where libraries are interested in receiving data from all respondents on all 22 core items. So a library may prefer to implement Lite most of the time but once in a while to switch to the long form if statistics or granularity is important on specific items. In those cases a consideration may be given whether it is useful to use a conversion formula.

Score conversion

One of the challenges in equating scores is to determine the equating function $Y = f(X)$, which is appropriate to use

in transforming an X score to the equivalent score on the Y scale. The purpose of developing equating functions is to transform the scores of those taking the long form to those taking the Lite form and vice versa so that the scores can be compared.

For the purposes of this study the ANOVA results indicate that the scores are comparable notwithstanding occasional and rare exceptions. In those occasional and rare cases where the difference between the long and Lite scores is indeed large and important, what are sensible criteria for the long scores to be equated with the Lite scores and the Lite scores to be equated with the long scores?

The experimental design used in this study allows for the three linking items to serve as anchor items. Respondents were randomly presented with alternative Lite forms so the general assumptions required to use linear equating are considered reasonable.²¹⁷ "Linear equating is based on the assumption that, apart from differences in means and standard deviations, the distributions of the scores on

²¹⁷ Linda Crocker and James Algina. *Introduction to Classical and Modern Test Theory* (New York: CBS College Publishing, 1986), 479.

form X and form Y are the same."²¹⁸ In situations where there is an answer test, let's say Z, and two different forms, let's say X and Y, the assumptions made in linear equating are:

1. The slope, intercept, and standard error of estimate for the regression of X on Z in a subpopulation are equal to the slope, intercept, and standard error of estimate for the regression of X on Z in the total population.
2. The slope, intercept, and standard error of estimate in the regression of Y on Z in subpopulation 2 are equal to the slope, intercept, and standard error of estimate for the regression of Y on Z in the total population.²¹⁹

These assumptions are reasonable when the groups are formed by random assignment which is the case in the way the long and Lite forms were presented to the respondents.

In the methods sections there were two approaches suggested for converting long scores into Lite and Lite scores into long score form. Here the two methods are explicated in terms of converting a score on the long form to a score on the Lite form.

²¹⁸ Ibid., 458.

²¹⁹ Ibid., 460.

(a1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form, the following simple formula may be used:

$$\text{LITE}\underline{X}_{ij} = \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])$$

where:

$\text{LONG}\underline{X}_{ij}$ = the score (e.g., 6.00, 7.00) of a given ith person, on any one given jth item (e.g., IC02, IC05, IC07), from a given subscale (e.g., Information Control, Library as Place), on the **long** protocol.

$\text{LONG}\underline{M}_L$ = the mean on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{M}_L$ = the mean on the **Lite** form on the linking item for a given subscale.

$\text{LONG}\underline{SD}_L$ = the standard deviation on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{SD}_L$ = the standard deviation on the **Lite** form on the linking item for a given subscale.

Using as a heuristic example with the published data from the University of Haifa we can calculate the converted score for a respondent (Faculty A). For example, for the published University of Haifa data for the perception score on the linking item for the Information Control scale, IC10 (i.e., the 10th of the 22 core items, which is an item from the Information Control scale), as reported:

$$\text{LONG}\underline{M}_L = 7.16;$$

$$\text{LITE}\underline{M}_L = 6.76;$$

$$\text{LONG}\underline{SD}_L = 1.44;$$

$$\text{LITE}\underline{SD}_L = 1.69.$$

If a particular participant, i = Faculty A, had a score of 6.00 on the long form on item j = IC02 (i.e., an Information Control item), Faculty A's equated score on the Lite form would equal:

$$\text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])$$

$$6.76 + ([6.0 - 7.16]) * (1.69 / 1.44)$$

$$6.76 + ([6.0 - 7.16]) * (1.17)$$

$$6.76 + (- 1.16]) * (1.17)$$

$$6.76 - 1.36 = \mathbf{5.40}$$

This formula does not take into account variations in the mean and standard deviation of the different items within a subscale.

A second formula presented in (b1) is also available. Again using the same heuristic example, but with the additional information regarding the behavior of the specific item being equated the results of conversion are presented below.

(b1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form, the formula below is also a viable alternative:²²⁰

$$\text{LITE}\underline{X}_{ij} = [([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_j] / \text{LONG}\underline{SD}_j) * (\text{LONG}\underline{SD}_j * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])] + [\text{LONG}\underline{M}_j - (\text{LONG}\underline{M}_L - \text{LITE}\underline{M}_L)]$$

where:

$\text{LONG}\underline{X}_{ij}$ = the score (e.g., 6.00, 7.00) of a given ith person, on any one given jth item (e.g., IC02, IC05, IC07), from a given subscale (e.g., Information Control, Library as Place), on the **long** protocol.

$\text{LONG}\underline{M}_j$ = the mean on the **long** form on the jth item;

$\text{LONG}\underline{SD}_j$ = the standard deviation on the **long** form on the jth item;

$\text{LITE}\underline{SD}_L$ = the standard deviation on the **Lite** form on the linking item for a given subscale;

$\text{LONG}\underline{SD}_L$ = the standard deviation on the **long** form on the linking item for a given subscale;

$\text{LONG}\underline{M}_L$ = the mean on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{M}_L$ = the mean on the **Lite** form on the linking item for a given subscale.

²²⁰ Bruce Thompson, Martha Kyriallidou, and Colleen Cook, "Equating Scores on "Lite" and Long Library User Survey Forms: The LibQUAL+® Lite Randomized Control Trials," *Performance Measurement and Metrics* (in press).

For example, for the published University of Haifa data for the perception score on the linking item for the Information Control scale, IC10 (i.e., the 10th of the 22 core items, which is an item from the Information Control scale), as reported in earlier studies:²²¹

$$\text{LONG}\underline{M}_L = 7.16;$$

$$\text{LONG}\underline{SD}_L = 1.44;$$

$$\text{LITE}\underline{SD}_L = 1.69;$$

$$\text{LITE}\underline{M}_L = 6.76.$$

If a particular participant, i = Faculty A, had a score of 6.00 on the long form on item j = IC02 (i.e., an Information Control item), for which for these data $\text{LONG}\underline{M}_{\text{IC02}} = 6.93$ and $\text{LONG}\underline{SD}_{\text{IC02}} = 1.80$, Faculty A's equated score on the Lite form would equal:

$$\begin{aligned} & [([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_j] / \text{LONG}\underline{SD}_j) * \\ & \quad (\text{LONG}\underline{SD}_j * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])] + [\text{LONG}\underline{M}_j - (\text{LONG}\underline{M}_L - \text{LITE}\underline{M}_L)] \\ & [([6.00 - 6.93] / 1.80) * (1.80 * [1.69 / 1.44])] + [6.93 - \\ & \quad (7.16 - 6.76)] \\ & [([6.00 - 6.93] / 1.80) * (1.80 * [1.69 / 1.44])] + [6.93 - \\ & \quad 0.40] \\ & [([6.00 - 6.93] / 1.80) * (1.80 * [1.69 / 1.44])] + 6.53 \\ & [([6.00 - 6.93] / 1.80) * (1.80 * 1.17)] + 6.53 \\ & [([6.00 - 6.93] / 1.80) * 2.11] + 6.53 \\ & [(-0.93 / 1.80) * 2.11] + 6.53 \end{aligned}$$

²²¹ Ibid.

$$[-0.52 * 2.11] + 6.53$$

$$-1.09 + 6.53 = \mathbf{5.44}$$

In this specific example the two methods are yielding almost identical results. We would expect similar findings for the most part across different items when using these two formulas. For the most part there is no large variation among the two alternative methods when applied in the LibQUAL+® data since subscale items tend to be similar in terms of their means and standard deviations.

Table 24 presents the means (and standard deviations) across the Lite and long forms on the total, subscale and linking item LibQUAL+® scores. Theoretically, because participants were randomly assigned one of the two administration protocols, and all participants in both groups responded to these 3 items, means (and standard deviations) should be equal or very similar, unless sample compositions of the persons electing to complete the survey differ in their views across the Lite and the long protocol. Linking items may be used to calculate equivalent scores across the long and the Lite protocol. The two protocols are not different from one another in terms of the respondents' scores; therefore the use of conversion formulas is not necessary. The conversion formulas provided here are presented mostly for theoretical considerations and for the exceptional occasion where results

may indicate an important difference between long and Lite forms.

Summary

A number of benefits were observed in relation to implementing a Lite form: (1) improved participation rates, (2) improved response times, and (3) at least as good quality scores as one may expect from the long protocol (if not slightly better due to increased response). Scores between long and Lite forms are deemed equivalent and can be aggregated. There are not important differences in the scores for Lite and long forms across different user groups and disciplines. In the rare event where score conversion is needed two alternative approaches are proposed for consideration. The second formula is preferable when subscale item means and standard deviations show marked differences within the long or the Lite protocol implementation.

CHAPTER 5. CONCLUSIONS, IMPLICATIONS, AND AREAS FOR FURTHER STUDY

It's not the place that we are at that I regret. It's the conversation that I feel we haven't had that I miss. I would very much like for us to have that conversation, and see where it takes us, even if we end up in a place much like the one where we started. *Bruce Thompson, p. 11, Standards in Conducting and Publishing Research in Education*²²²

Following is a summary of the purpose, methods, and major results of the research conducted in this study. Based upon these data, conclusions are drawn, implications for practice are outlined, and areas for further study are presented.

Questions and Methods

The purpose of the study was twofold: (a) identifying whether item sampling using matrix sampling methods produced an improved version of the survey protocol, LibQUAL+® Lite, for institutions that participated in randomized control trial experiments; in particular, improvements regarding participation rates, completion time for the survey, and results comparisons are expected to

²²² Bruce Thompson, "Standards in Conducting and Publishing Research in Education," 2007 Keynote Address at the Midwestern Educational Research Association Annual Meeting, <http://www.coe.tamu.edu/~bthompson/> (accessed on October 12, 2009).

emerge in the Lite version of the protocol within different institutional settings; (b) identifying whether there are differences in the total, subscale, and linking item scores between the long and the Lite protocol overall as well as within the three main user groups: undergraduate students, graduate students and faculty. For the purposes of this study we analyzed data from more than 10,000 library users from 14 institutions that implemented randomized control trials during the spring 2008, fall 2008, and spring 2009 survey cycles.

The following six research questions were addressed in the study:

1. How much do participation rates differ between the long and the Lite version of the LibQUAL+® protocol?
2. How much do completion times differ between the long and the Lite version of the protocol?
3. Are the perception scores on the LibQUAL+® overall score, the three dimension scores (Affect of Service, Information Control and Library as Place), as well as the three linking items the same between the long and the Lite version of the protocol?

4. Are the scores on the total, subscale and linking item scores the same between the long and the Lite version of the protocol for each one of the participating libraries?
5. Are the scores on the overall, the three dimensions and the three linking items the same between the long and the Lite version of the protocol **within** each user group (undergraduates, graduate students, and faculty) across all participating institutions?
6. If there are score differences what are the adjustments we need to implement to convert scores from one version of the protocol to the other (long form scores to Lite ones and Lite form scores to the long form)?

Summary of Major Findings

Research question 1 asked, "How much do participation rates differ between the long and the Lite version of the LibQUAL+® protocol?" Participation rates are improved with the Lite protocol ranging from 10.6 to 3.1 percent higher participation across the 14 participating institutions.

Research question 2 asked "How much do completion times differ between the long and the Lite version of the protocol?" Overall, it took a mean 418 (SD = 480) and median 302 seconds to complete the Lite version (Table 4)

and a mean of 659 (SD = 621) and a median of 507 seconds to complete the long version (Table 5). This is a difference of 241 seconds for the mean (4.01 minutes) and 205 seconds (3.41 minutes) for the median.

Research question 3 asked "Are the perception scores on the LibQUAL+® overall score, the three dimension scores (Affect of Service, Information Control and Library as Place), as well as the three linking items the same between the long and the Lite version of the protocol?" As reflected in Table 6 η^2 effect sizes, there was little difference between means on the long and the Lite form for all examined scores. The largest effect size is 1.16 percent for the Information Control linking item (The electronic information resources I need). Despite statistically significant p values ($\alpha = .05$) for total scores, Information Control and Library as Place subscale and linking items scores, the low effect sizes indicate there was little, if any, practical difference between responses in the long and Lite forms. In conclusion, the long and the Lite form scores are essentially the same.

Research question 4 asked "Are the scores on the total, subscale and linking item scores the same between the long

and the Lite version of the protocol for each one of the participating libraries?" In general the results within each one of the participating libraries confirm the overall pattern. There are slight differences between the long and the Lite form in that the Lite form produces slightly lower scores for the Information Control and Library as Place concepts. In general these differences are small and for the most part within random error expectations.

Research Question 5 asked "Are the scores on the overall, the three dimensions and the three linking items the same between the long and the Lite version of the protocol **within** each user group (undergraduates, graduate students, and faculty) across all participating institutions?" The answer is yes, the scores are the same for the different user groups between long and Lite with small differences of course observed. The effect size statistics are very small in all these cases indicating that there is little practical significance in these observed differences.

Given the current findings, it is questionable whether score adjustment is necessary. In answering the question whether it is important to adjust the scores between the two protocols, the answer is no based on the evidence

presented so far. Most of the time it seems unnecessary to adjust scores given that the differences are relatively small and of limited practical importance (very small effect size statistics).

Research question 6 asked "If there are score differences what are the adjustments we need to implement to convert scores from one version of the protocol to the other (long form scores to Lite ones and Lite form scores to the long form)?" Two reasonable methods were presented for adjusting scores if needed. Illustrative examples were presented with both formulas. The formulas are using linear equating which is a reasonable approach given that the groups taking the long and the Lite form are formed by random assignment. In general, the need for adjusting LibQUAL+® scores between the long and the Lite protocol is low though.

Unique Features of the Study

The current study is characterized by some unusually advantageous aspects that support the soundness of the research design and results. The sample size for testing the differences between the long and the Lite protocol is very large, with over 10,000 respondents. Second, the study reports a series of randomized control trials that are

triple-blind trials as all three key players, (a) participants, (b) researchers, and (c) the librarians who were coordinating the survey process, did not know who was receiving the "treatment" and who was in the control group. Third by virtue of analyzing the differences within institutions and different user groups, analyses were externally replicated within the study itself.

Conclusions

The most important conclusion is that LibQUAL+® Lite is the preferred and improved protocol with higher participation rates and reduced response times. It is evident that on the Internet when it comes to filling in surveys the difference between the long and the Lite version of the survey is enough to result in higher participation rates ranging from 3.1 to 10.6 percent more for surveys that reduce response times from 10 to 6 minutes.

Secondly, the Lite and the long form are not different in terms of the scores they produce, though Lite may be producing slightly lower scores than the long form. The fact that for the most part there are small differences which are in the direction of Lite producing slightly lower scores, one may argue that the Lite form produces slightly

more accurate estimates of the population statistics for these concepts especially since the response rate is slightly higher for the Lite form. Given that Lite forms have higher participation, significantly lower completion times than the long forms, and possibly slightly more accurate scores, Lite is advantageous and the preferred form to implement.

We conclude that the LibQUAL+® Lite protocol is indeed the preferred method in terms of achieving higher participation rates and reduced response burden. Across all institutions analyzed the participation rates were higher for the LibQUAL+® Lite protocol compared to the long version of the protocol. In other words higher percentages of persons who start the LibQUAL+® Lite protocol complete the survey. LibQUAL+® Lite takes about 60 percent of the time needed to complete the longer version of the protocol.

Implications

More respondents fill in the LibQUAL+® Lite survey enhancing the quality of the evaluation data received while respondent burden is reduced. The scores are equivalent with slightly lower scores for the Information Control and Library as Place dimensions, a difference that is not

important enough to require score conversion from the Lite to the full version of the scores and vice versa.

Though score conversion is not needed, here are some circumstances under which score conversion may be more useful. Score conversion may be more useful for large research libraries that rely heavily on the LibQUAL+® protocol through annual or biennial implementations. Other libraries may find it useful to get a local baseline of the LibQUAL+® Lite implementation the first time around by selecting a small portion of the surveys to be in the long form (in general 80 percent Lite / 20 percent long). For the majority of libraries the score conversion formulas presented in this study should suffice for converting Lite scores into long form scores and long form scores into Lite form scores if they deem that conversion is important in their setting.

Some of the issues to consider as libraries are moving into adopting LibQUAL+® Lite is the loss of information at the item level since the number of respondents at the item level is smaller for those items that are randomly selected and as a result the level of analysis into the data at the item level is limited for different subgroups. In other

words if a library is interested in tracking its performance on a specific question for a segment of their population that is relatively small, there may not be an adequate number of respondents from that subgroup for the specific item the library wishes to track in detail. Under those circumstances the library may want to consider implementing the long protocol.

If there are not special needs to look into specific survey item scores for subgroups of limited extensiveness, it is recommended that the library choose to implement the LibQUAL+® Lite protocol for all the surveys (100 percent) presented to the library users.

Areas for Further Study: LibQUAL+®

Systematic research regarding the qualitative data collected through LibQUAL+® and LibQUAL+® Lite would be very useful as it would provide insights as to whether the quality of the comments improves with the presentations of the Lite form. The proportion of time reduced in filling LibQUAL+® Lite is not equal to the proportion of the reduction in the items, possibly indicating that respondents are spending more time reflecting on their answers with the Lite form. In other words the analysis on

Lite vs long suggests that those completing the Lite may have spent more time (and thus more thought) per question as the reduction in time is not simply proportional to the decrease in the number of questions. Does this translate in either larger amounts of text provided in the comments box or more thoughtful and useful feedback?

Libraries invest time in analyzing the qualitative feedback and we need to gain a better understanding of the methods and approaches they use. Understanding similarities in approaching qualitative data, both conceptually and from a tool specific perspective, would also increase our ability to start doing cross institutional analysis of the qualitative data received in the form of comments.

An area that needs further refinement is the ability to customize the user groups for the different settings both in terms of being able to change the nomenclature (for example first year or freshman), but also in terms of being able to deselect certain user groups and levels that may not be applicable to a certain survey administration or institution. In particular, user group comparisons across institutions in different countries can be very problematic. For example, despite the existence of the

Bologna agreement that attempts to harmonize the student levels across European countries, there is still considerable variation that makes the comparisons of student groups very difficult from country to country (an example is the treatment of graduate students that are considered undergraduates in the Scandinavian countries). The comparability is even more challenging when it comes to faculty levels or how different institutions treat their research staff which may be part of the faculty group in one setting and part of the general university staff category in another setting.

In general the tension between standardization and local control needs to be considered carefully as it may relate to the adoption of the Lite version. With the Lite version emphasis is placed on the dimension statistics rather than the item level statistics. Libraries that have a particular interest for a specific item may eventually want the ability to control the appearance of that item and make it appear to all respondents much like the linking items appear to all respondents in the current design. One could conceive of a version of LibQUAL+® Lite in the future where the linking items may be controlled by the local library if an interest in accommodating a specific item is strong.

Item level statistics can also be calculated using imputation methods. Experimentation with various imputation methods is highly recommended in future studies, i.e. the notion of imputing missing values for Lite form implementations. Imputation refers to techniques where missing data are estimated given what is known. Different approaches of imputing the missing data for Lite should be explored in future years. There is some literature in this area in various fields (service marketing, education, and other social sciences).²²³ It would be useful to see some thoughtful approaches in the library field, and in particular as they may be applied to LibQUAL+® Lite.

Areas for Further Study: Library Assessment

Web-survey research has a good footing in the library field and a lot of potential yet caution should be exercised and methods should be carefully developed and tested as we are trying to understand the behavior of users who may never come into our library buildings in the years to come and the only way of connecting with them may be through virtual rather than physical encounters. A web-survey methodology

²²³ Feray Adiguzel and Michel Wedel, "Split Questionnaire Design for Massive Surveys," *American Marketing Association* 45 (2008): 608-617; Wagner A. Kamakura and Michel Wedel, "Factor Analysis and Missing Data," *Journal of Marketing Research* 37 (2000): 490-498; Wagner A. Kamakura and Michel Wedel, "Statistical Data Fusion for Cross-Tabulation," *Journal of Marketing Research* 34 (1997): 485-498.

is a needed encounter that can solicit useful information for management and development purposes as libraries are creating extensive digital presences in the years to come. Library evaluation frameworks need strategic focus and complexity for addressing an increasingly complex environment.

As the fifth law of Ranganathan reminds us "The Library is a Growing Organism" indicating that the library needs to adapt to new conditions:

Library services cannot be evaluated solely in relation to the demands placed upon them by present users. Such evaluation accepts demands at face value and assumes that these demands are co-extensive with user needs, which is not invariably true... If evaluation activities focus only on the demands (i.e., expressed needs) of present users and fail to study the needs lying behind these demands, or if they ignore the latent needs that are not converted into demands as well as the potential needs of present non-users, the danger exists of creating a self-reinforcing situation. That is, the library is constantly improving its ability to respond to the present type of demand and, by so doing, perhaps reducing its ability to attract new users or new users of the resources available. Such a library is far from being a growing organism.²²⁴

The following questions still remain with us for all the progress we have made in the recent past: What are the

²²⁴ F. Wilfrid Lancaster, *If You Want to Evaluate Your Library* (Champaign: University of Illinois, Graduate School of Library and Information Science, 1988), 14-15.

characteristics that would enhance the quality of information users receive from the library? How can we evaluate the impact and value of library services on faculty, undergraduate and graduate student learning, research and teaching? Is the library a concept of low or high salience and how can its impact, value, and importance be increased? What is the acceptable, desired, or enticing 'return on investment' (ROI) a user may wish to see from a library encounter especially as users want to be increasingly self-sufficient in the way they interact with information resources and services?²²⁵ What would it take for libraries to exceed user expectations?

Extensive support and need for in-depth physical and digital library evaluation as well as about the effectiveness of information seeking behaviors is needed in the years to come. Digital library evaluation is mostly formative in its approach and there is a great need to understand those elements that are defining success across settings, institutions, and projects in the digital or virtual world. Evaluating networked electronic services and

²²⁵ A recently announced three-year IMLS grant starting in December 2009 to the University of Tennessee, University of Illinois at Urbana-Champaign, and ARL will further explore this question. For related work, see Paula Kaufman, "The Library as Strategic Investment: Results of the Illinois Return on Investment Study," *Liber Quarterly* 18, no. 3/4 (2008): 424-436.

resources is a close synonym to digital library evaluation these days. Both areas of investigation need to be further explored in depth.²²⁶ They both relate to the Information Control dimension of LibQUAL+®, the dimension with the highest rating indicating a level of increased importance according to thousands of library users. Some modeling research has taken place in this area as it relates for example to the scholarly information practices in the online environment.²²⁷ Future work is also highly desirable.

Closing Statement

The current study is an addition to the continuous qualitative and quantitative, iterative process that is necessary to maintain a useful and high impact library survey instrument like LibQUAL+®. LibQUAL+® Lite “shows considerable promise of serving as a tool of some utility in listening to user voices”²²⁸ much like the full version of LibQUAL+® has in the recent past.

²²⁶ Brinley Franklin, Martha Kyrillidou, and Terry Plum, “From Usage to User: Library Metrics and Expectations for the Evaluation of Digital Libraries”; and Martha Kyrillidou, Colleen Cook, and Yvonna Lincoln, “Digital Library Service Quality: What Does It Look Like?” in *Evaluation of Digital Libraries: An Insight into Useful Applications and Methods*, ed. Giannis Tsakonas and Christos Papatheodorou (Oxford: Chandos Publishing, 2009).

²²⁷ Carole L. Palmer, Lauren C. Teffeu, and Carrie M. Pirmann, *Scholarly Information Practices in the Online Environment: Themes from the Literature and Implications for Library Service Development* (Dublin, OH: OCLC Research and Programs, 2009).

²²⁸ Colleen C. Cook, “A Mixed-Methods Approach to the Identification and Measurement of Academic Library Service Quality Constructs: LibQUAL+TM” (PhD diss., Texas A&M University, 2001), 276.

In summary, LibQUAL+® Lite offers a viable and preferred alternative to the long form of 22 core items that has been established since 2003. LibQUAL+® Lite uses item sampling methods to: (a) gather data on all 22 LibQUAL+® core items, while (b) each individual participant responds to only a subset of items. Every Lite user responds to one “linking” item from each of the subscales, and to a randomly-selected subset of five items from the remaining 19 (22-3) core LibQUAL+® items. As a consequence, survey response times are roughly cut in half, while the library still receives data on every survey question.

LibQUAL+® Lite is a highly recommended protocol for libraries as they continue to engage rigorously in listening to their users and improve their services in the coming years. The LibQUAL+® Lite total market survey is only one method among many that libraries need to deploy as they improve existing services and develop new and innovative approaches for serving their users.

The matrix sampling method, the randomized control trial framework, and the statistical analysis methods outlined in

the current study are useful heuristic methods for other high stakes library survey implementations whether for a physical or a digital library environment. These methodological approaches add rigor and thoughtful perspectives as they inform ways libraries shape their services and “touch” their users through improvements and innovations in the years to come.

CHAPTER 6. FIGURES

Figure 1. Evolution of LibQUAL+® Dimensions, 2000-2009

2000	2001	2002	2003-2009
41 items	56 items	25 items	22 items
Affect of Service	Affect of Service	Service Affect	Service Affect
Library as Place	Library as Place	Library as Place	Library as Place
Reliability	Reliability	Personal Control	Information Control
Provision of Physical Collections	Self-Reliance	Information Access	
Access to Information	Access to Information		

Figure 2. Qualitative and Quantitative Iterative Processes Used in the Development of LibQUAL+®

13 Libraries
English LibQUAL+™ Version
4000 Respondents

	<u>PURPOSE</u>	<u>DATA</u>	<u>ANALYSIS</u>	<u>PRODUCT/RESULT</u>
Emergent 2000 QUAL	Describe library environment; build theory of library service quality from user perspective	Unstructured interviews at 8 ARL institutions	Content analysis: (cards & Atlas TD)	Case studies
	Test LibQUAL+™ instrument	Web-delivered survey	Reliability/validity analyses: Cronbachs Alpha, factor analysis, SEM, descriptive statistics	Valid LibQUAL+™ protocol Scalable process Enhanced understanding of user-centered views of service quality in the library environment
	Refine theory of service quality	Unstructured interviews at Health Sciences and the Smithsonian libraries	Content analysis	Cultural perspective
	Refine LibQUAL+™ instrument	E-mail to survey administrators	Content analysis	Refined survey delivery process and theory of service quality
	Test LibQUAL+™ instrument	Web-delivered survey	Reliability/validity analyses including Cronbachs Alpha, factor analysis, SEM, descriptive statistics	Refined LibQUAL+™ instrument
	Refine theory	Focus groups	Content analysis	Local contextual understanding of LibQUAL+™ survey responses
Iterative 2009 QUAL			Vignette Re-tooling	

More than 1,000+ Libraries in 18 different languages,; anticipating annually more than 200 libraries and 150,000+ respondents

Source: Colleen Cook, Dean of Libraries, Texas A&M University Libraries

Figure 3: Dimensions of Library Service Quality

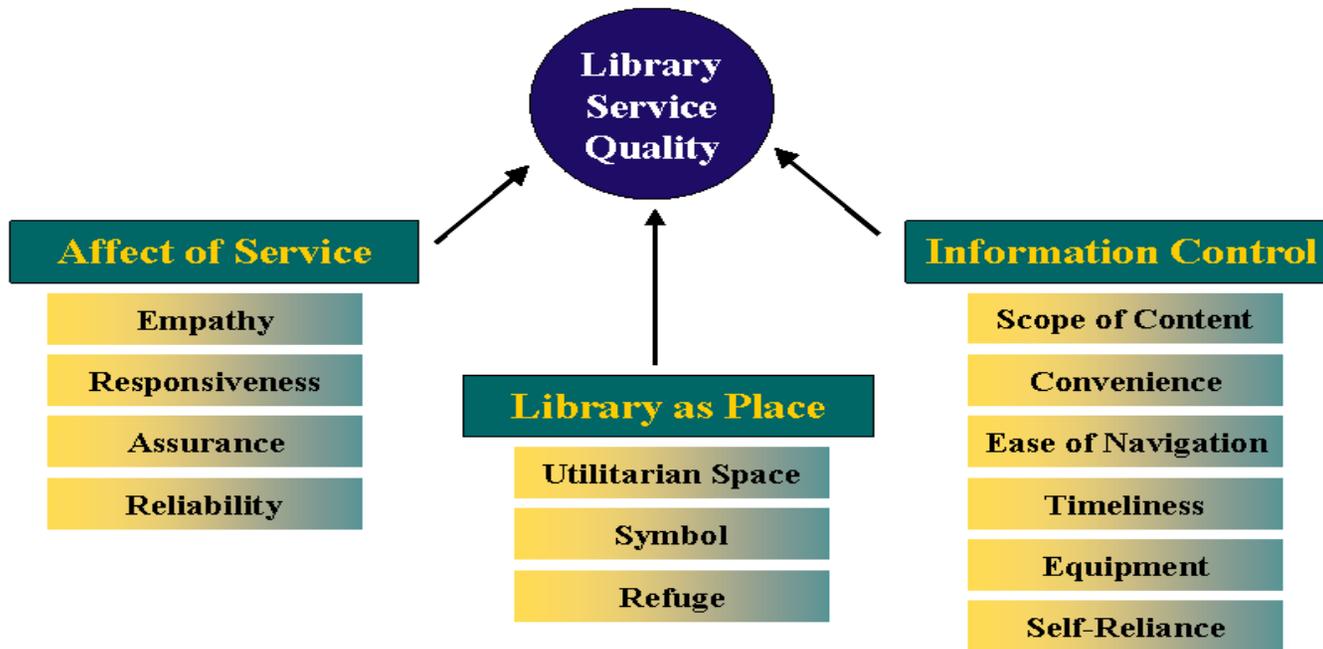


Figure 4. LibQUAL+® Participation

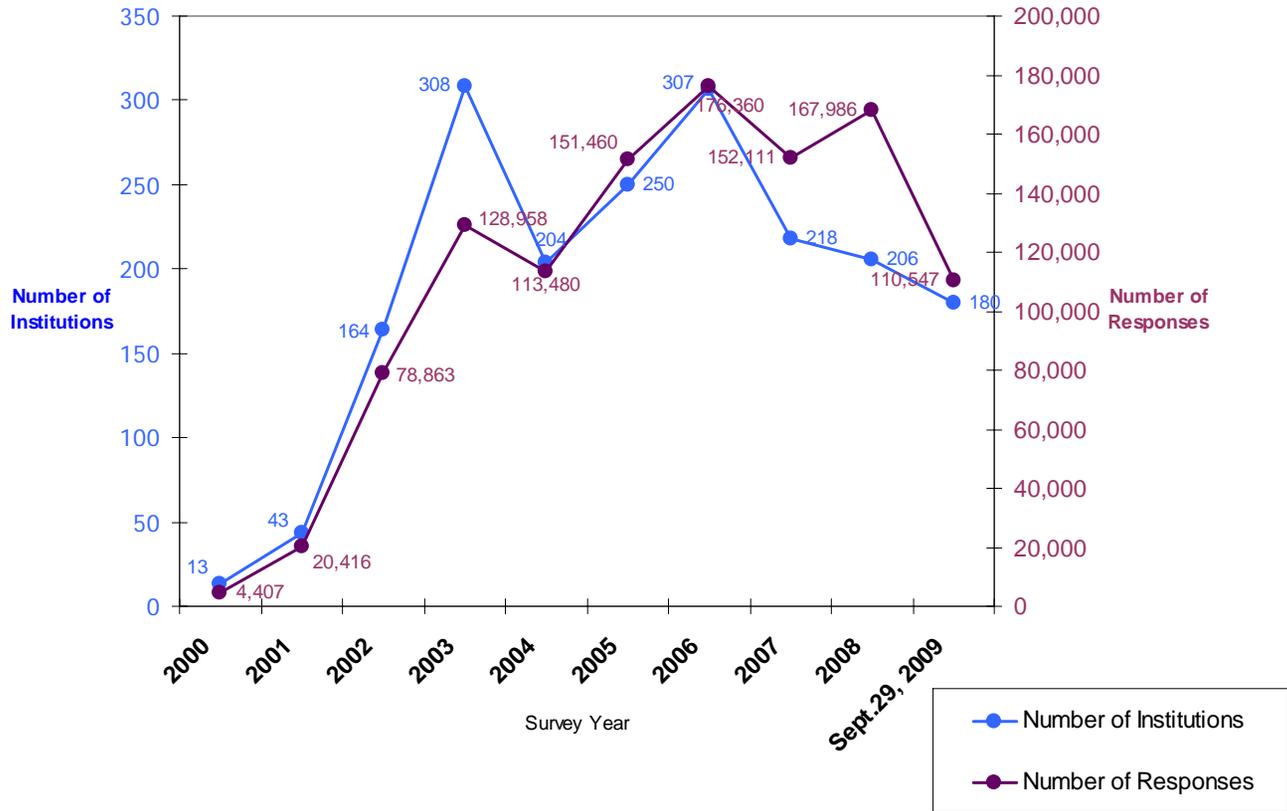


Figure 5. Screenshot of Configuration Web Page Demonstrating the Ability to Set the Lite View Percentage

A. Configure Your Survey

Preferences Customization Optional Questions Branch Library Options Custom Options

Preferences

Please follow the instructions below to select your survey preferences.

- Survey Title**—Please choose a label to display on your results report. This label should not be more than 60 characters long.
- Survey Start and End Dates**—Please indicate the dates you intend to open and close the survey at your institution. Note that these dates are for our information only and are not binding. **You must manually open and close your survey.**
- Lite-view Percentage**—There are two versions of this survey: the full version with 22 core questions and a "lite" version with 8 core questions. Please enter the percentage of patrons who should receive the shortened "lite" survey.
- SPSS Data File Delivery**—Please check the box if you would like an SPSS datafile e-mailed to your institution's primary contact. This will be delivered to you a few months after a session closes. Note the raw data from the survey are available in a CSV format automatically as soon as you close your survey.

English (British): Test (BE)
German: Test (German)

Start Date: 01/01/2008 (month)
End Date: 12/31/2008 (month)

Lite Views: 50%

Send me an SPSS data file

next step >

Ability to set your Lite View Percentage

B. Preview Your Survey

Preview the LibQUAL+® survey as it will appear to users at your institution. This step allows you to ensure live at your institution. You must view and complete a preview of your survey in every language in which it is being offered, before you will be permitted to launch your survey. Use the checklist at the right to ensure all previews have been completed.

English (British) Preview Survey
German Preview Survey

Ability to customize, preview, and launch dual language surveys in one interface

C. Launch Your Survey

Click the button below to launch your survey and receive your URL(s) for distribution. Note that the button will not be activated until all previews are completed. Also be aware that once your survey is launched, no further changes or customizations can be made.

Launch

Figure 6. Total Score: 95% confidence intervals around the means per institution on the long and Lite protocols

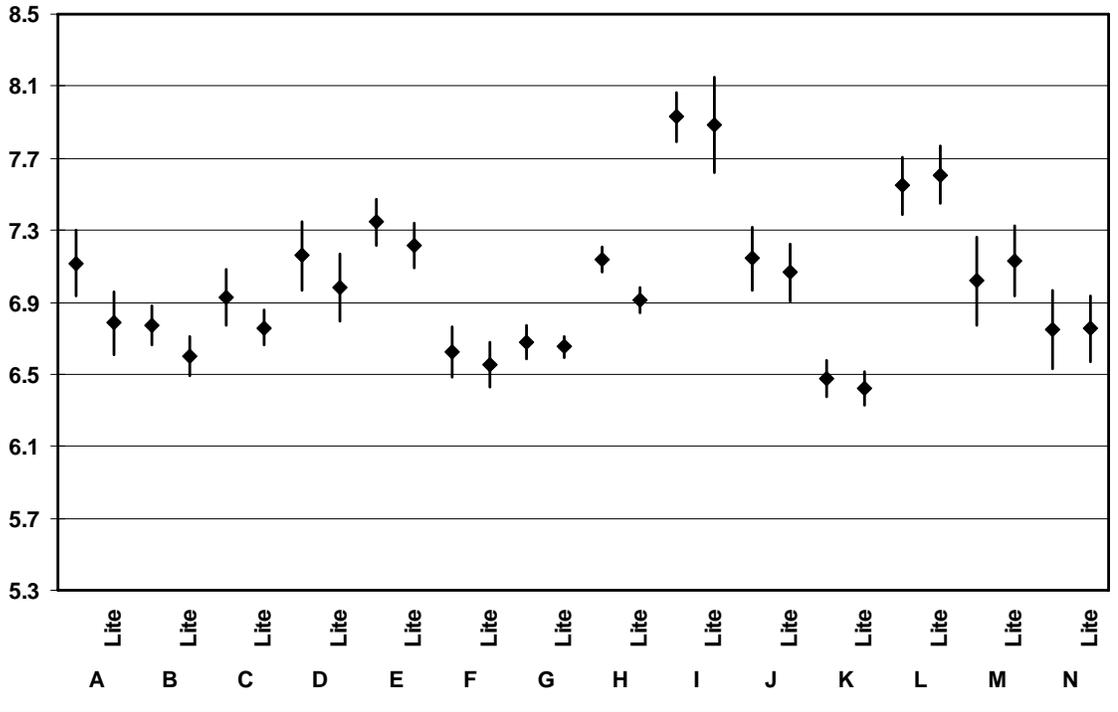


Figure 7. Affect of Service: 95% confidence intervals around the means per institution on the long and Lite protocols

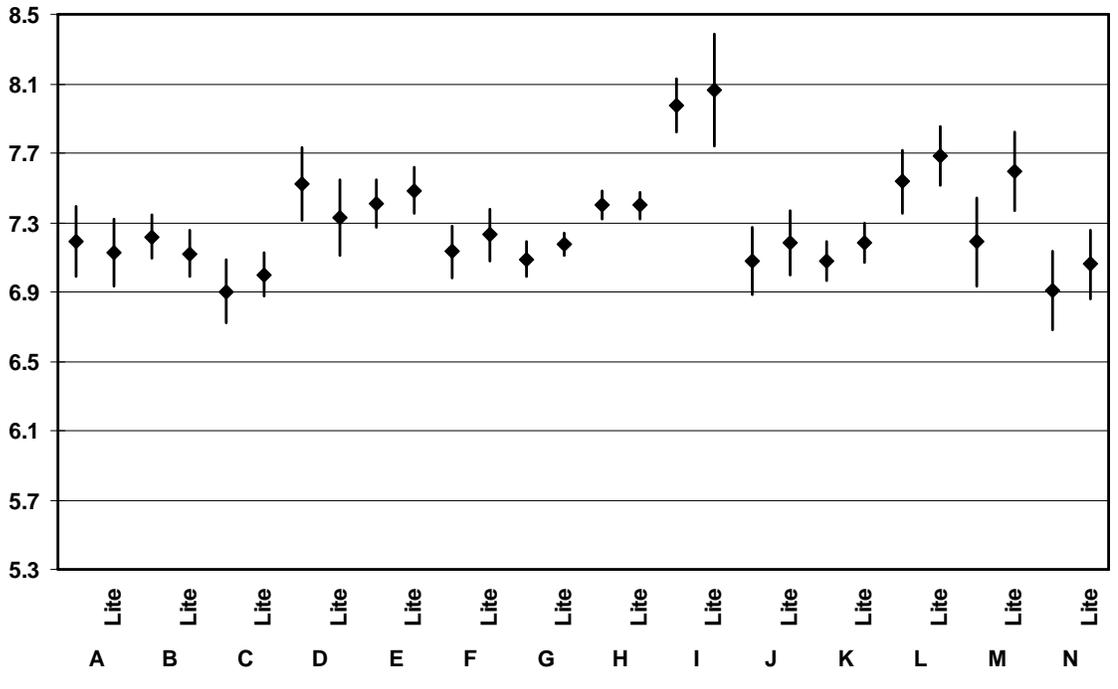


Figure 8. Information Control: 95% confidence intervals around the means per institution on the long and Lite protocols

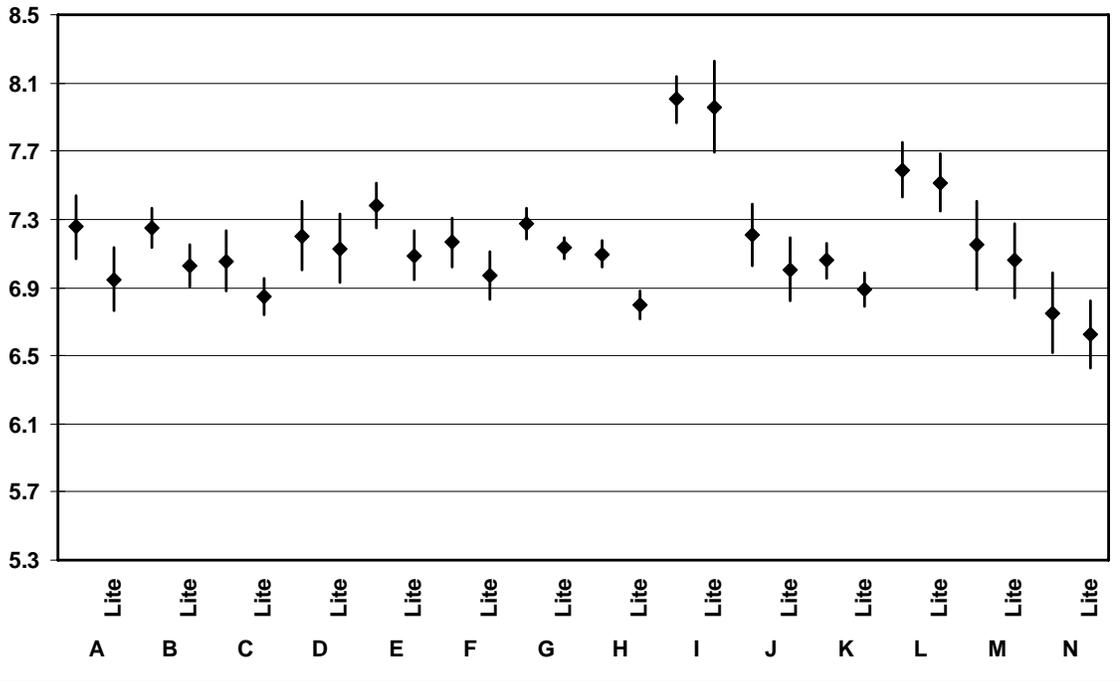


Figure 9. Library as Place: 95% confidence intervals around the means per institution on the long and Lite protocols

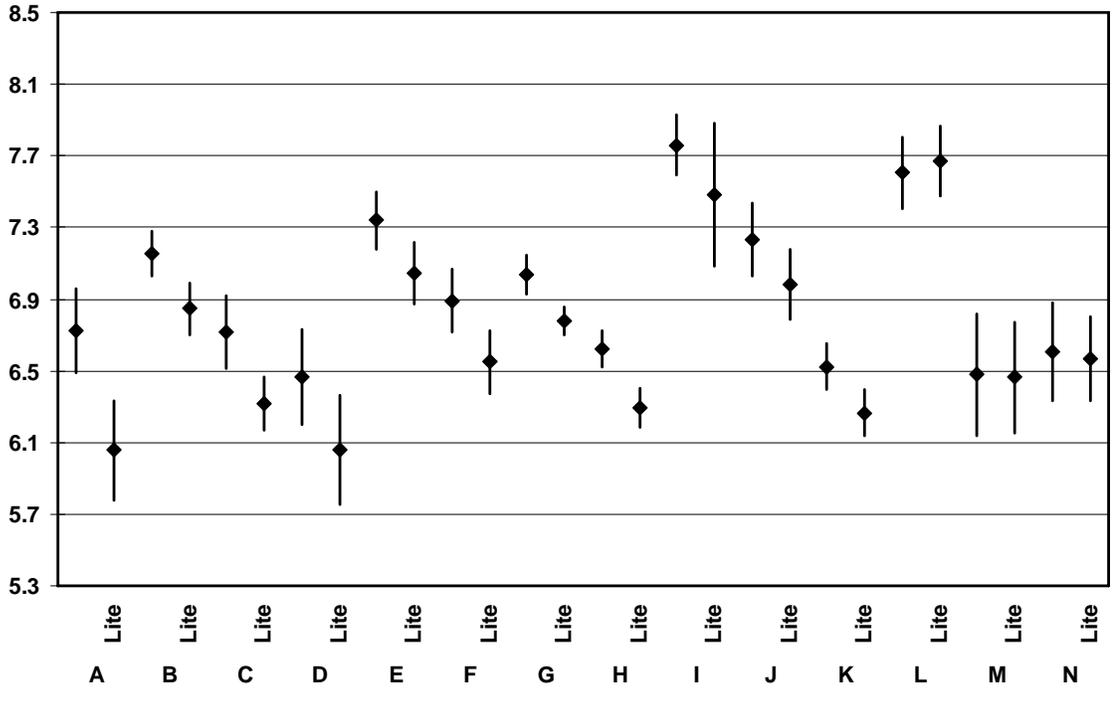


Figure 10. Affect of Service linking item: 95% confidence intervals around the means per institution on the long and Lite protocols

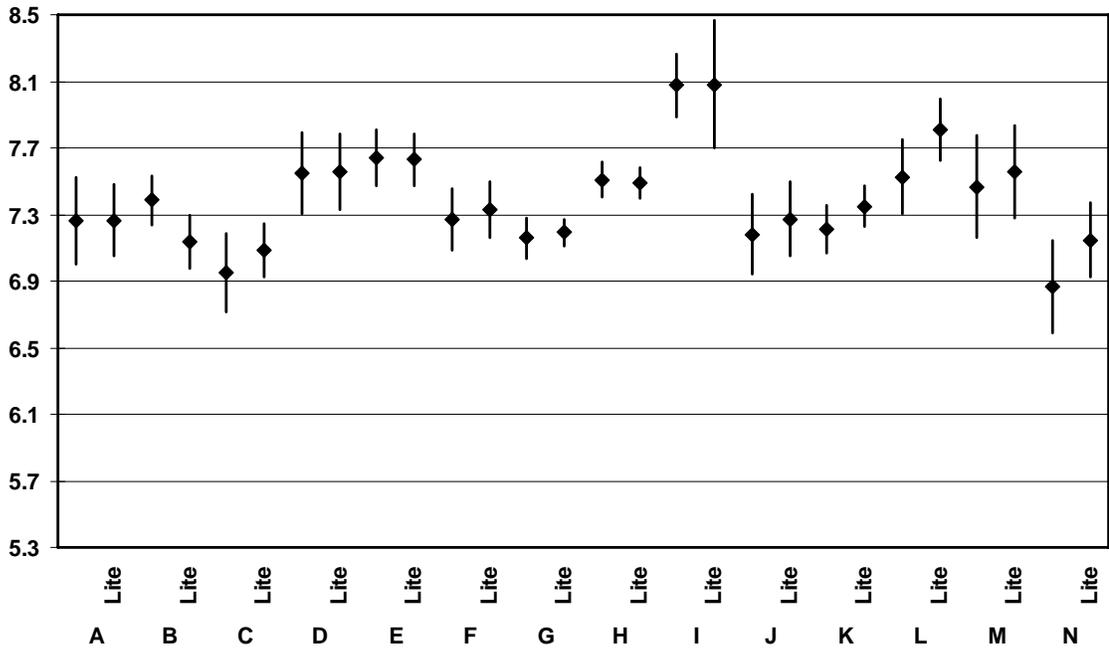


Figure 11. Information Control linking item: 95% confidence intervals around the means per institution on the long and Lite protocols

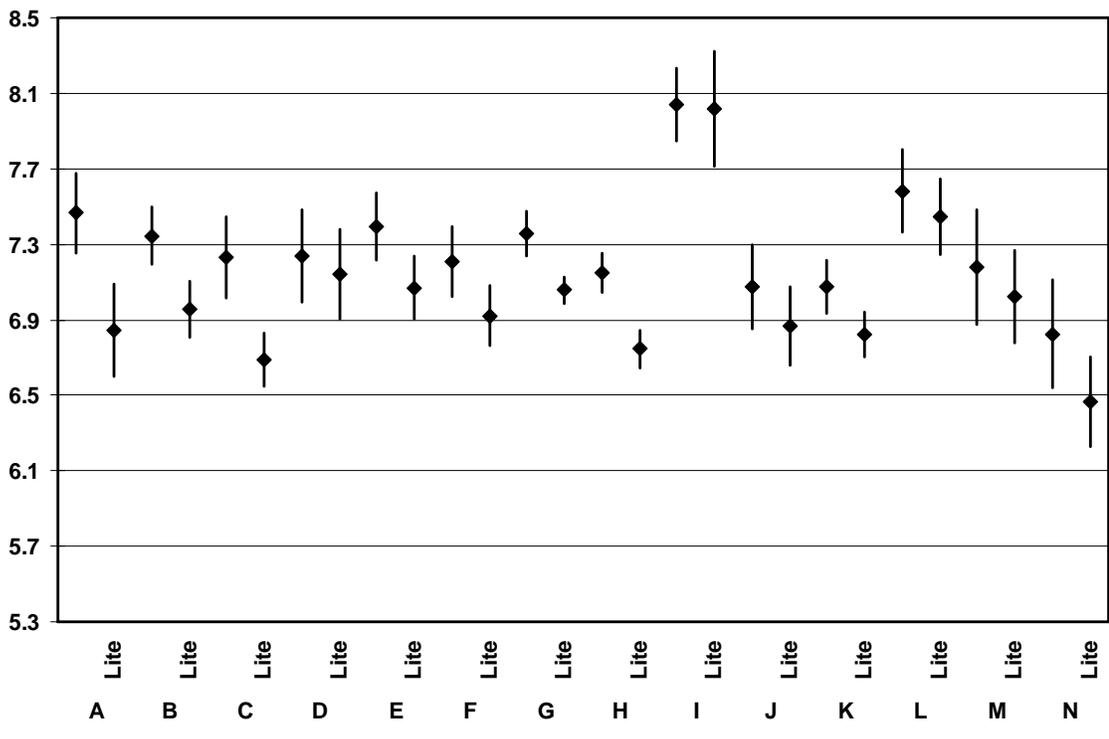


Figure 12. Library as Place linking item: 95% confidence intervals around the means per institution on the long and Lite protocols

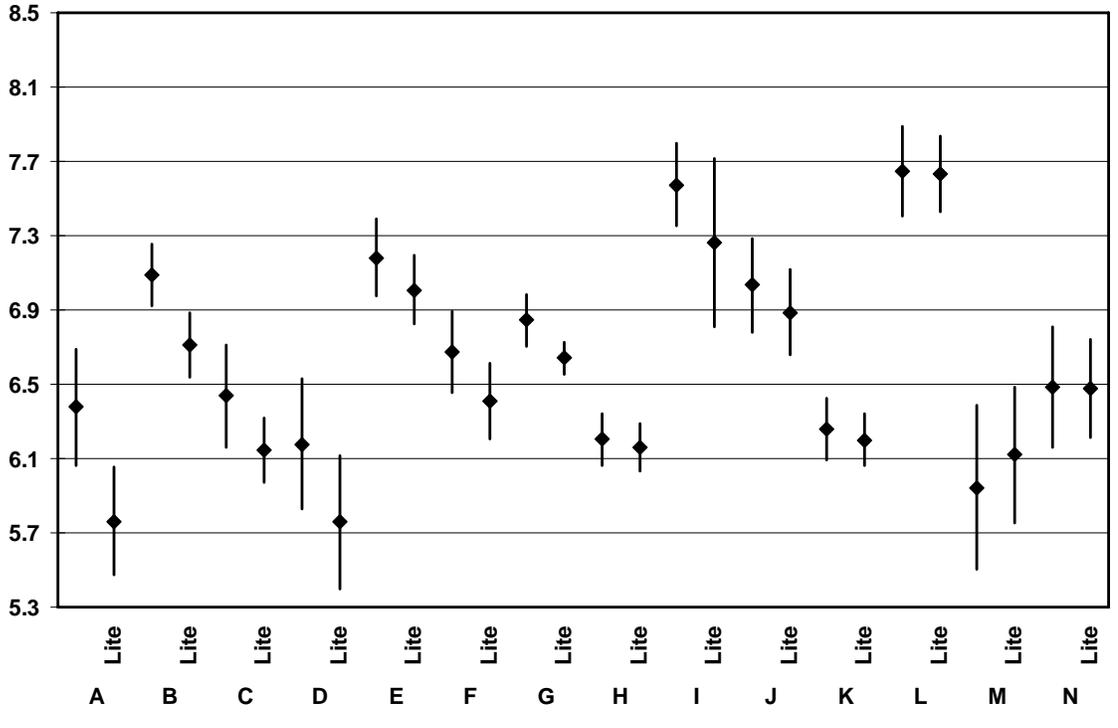


Figure 13. Interaction Effect for Total Score

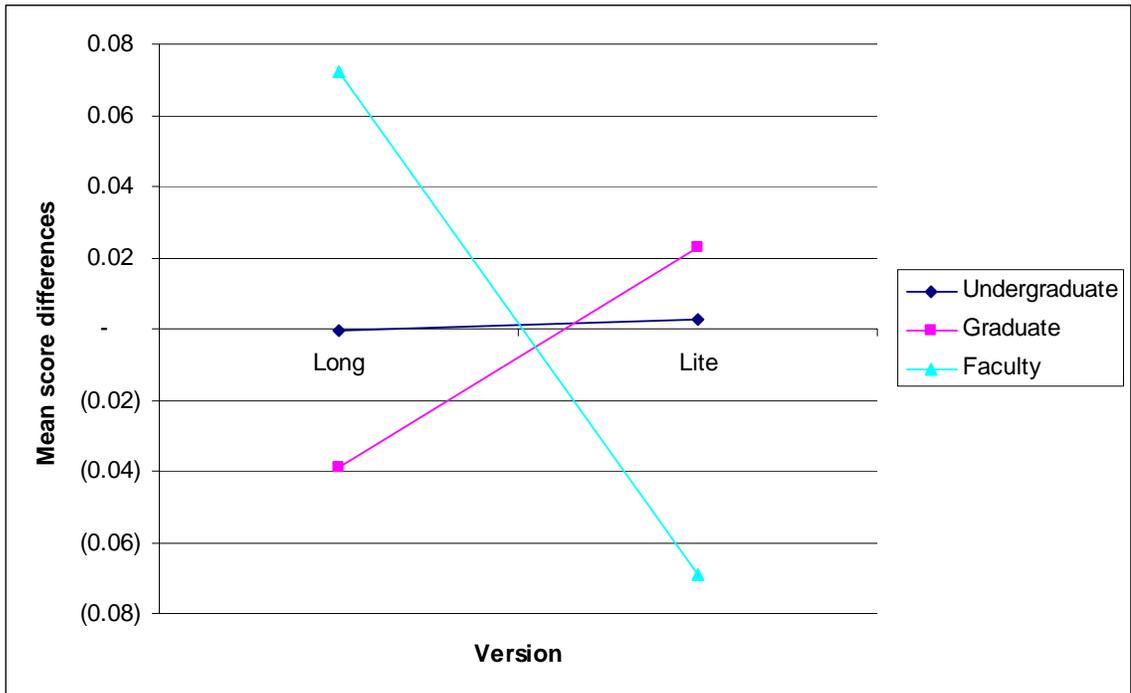


Figure 14. Interaction Effect for Affect of Service

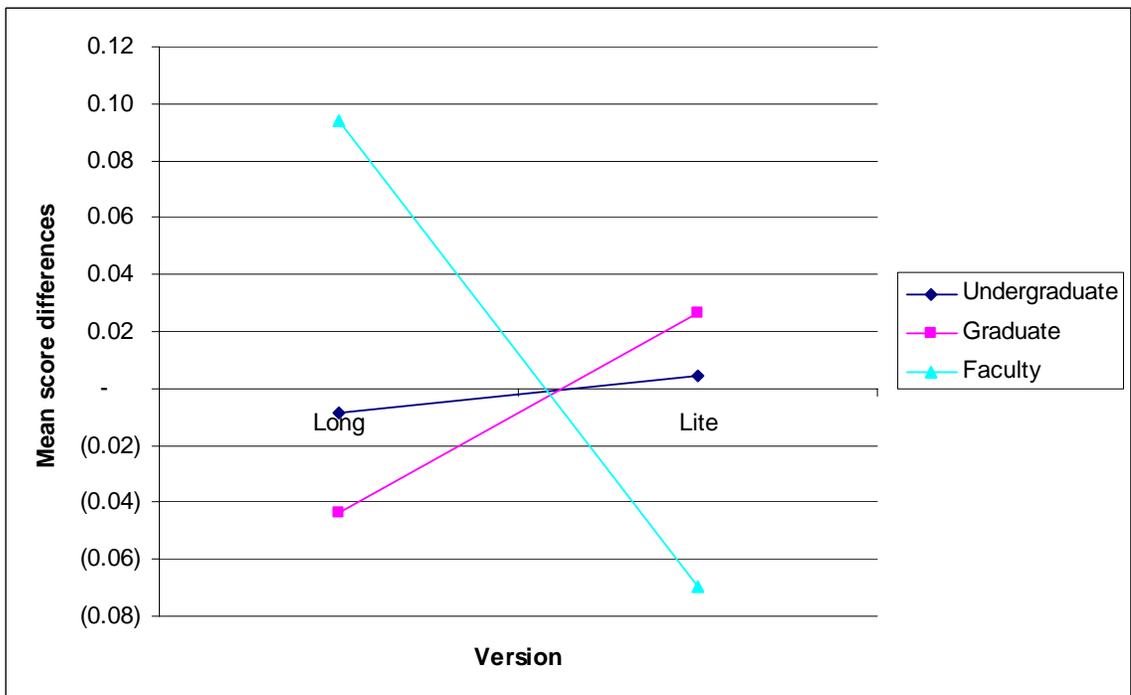


Figure 15. Interaction Effect for Information Control

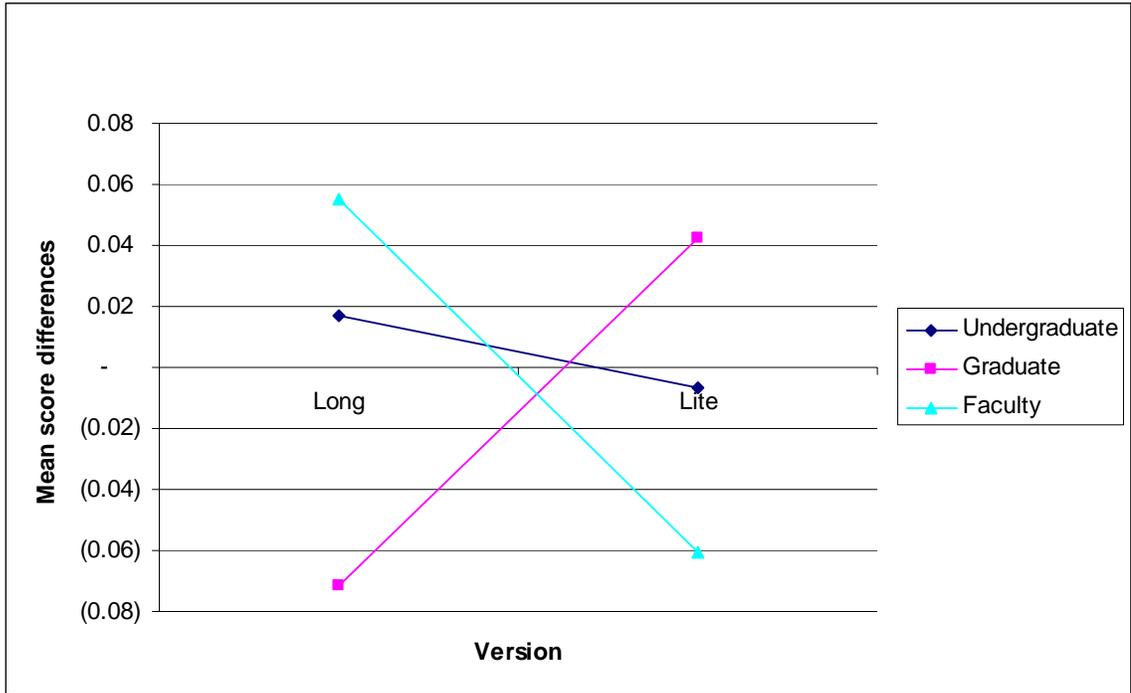


Figure 16. Interaction Effect for Library as Place

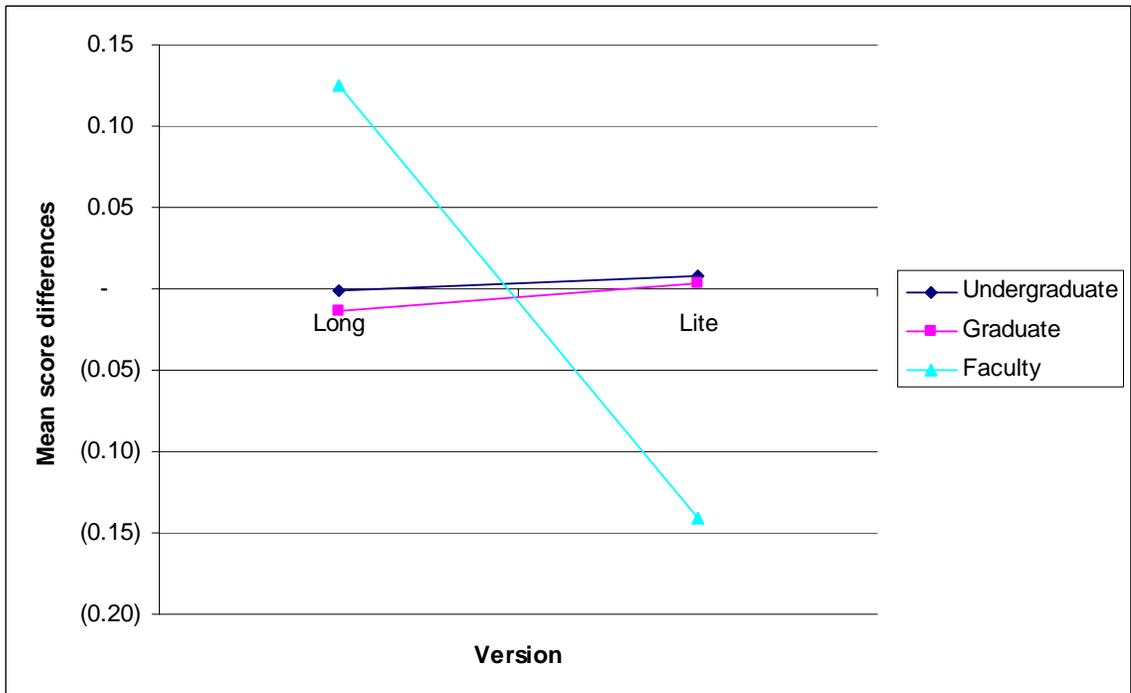


Figure 17. Interaction Effect for Affect of Service Linking Item

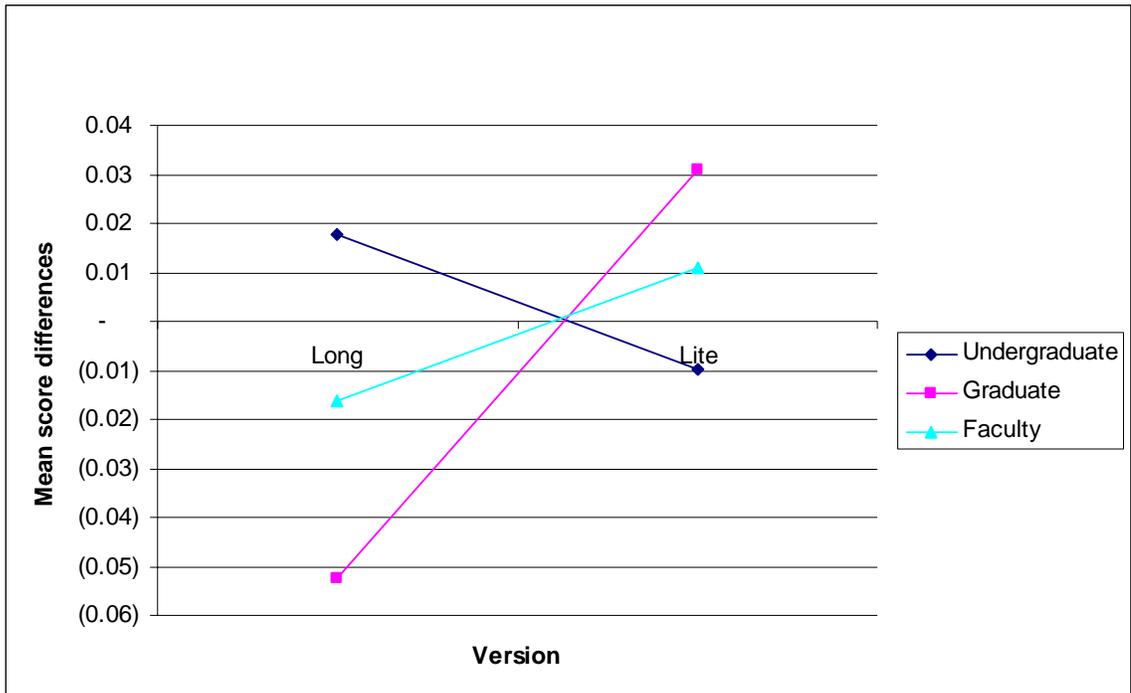


Figure 18. Interaction Effect for Information Control Linking Item

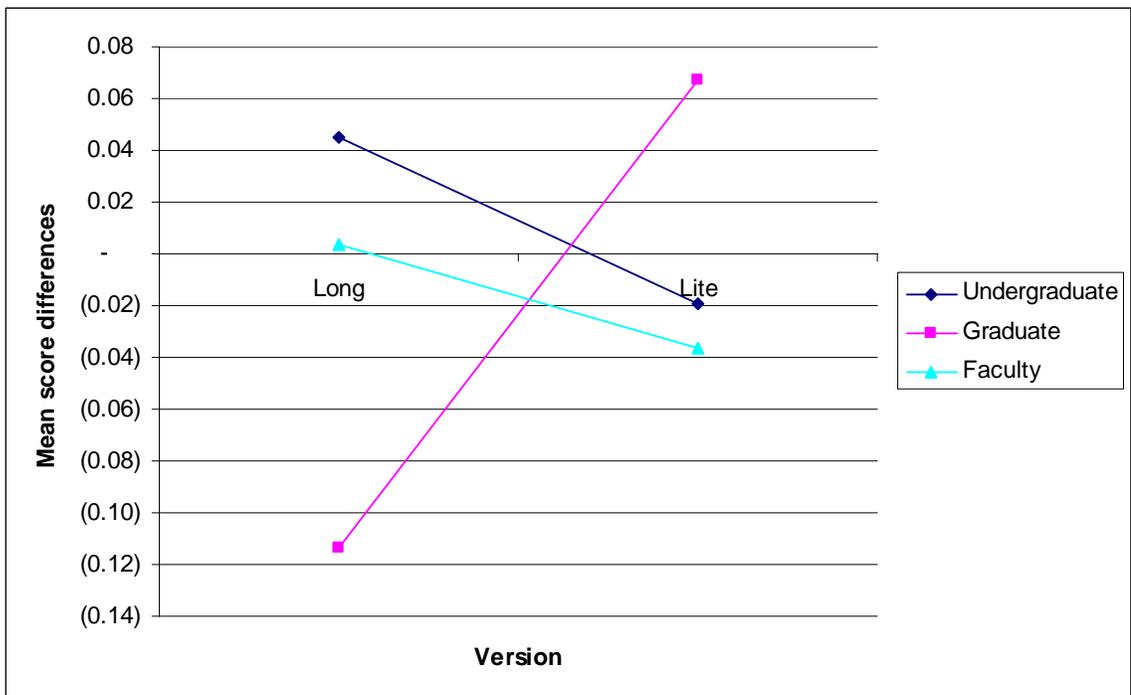
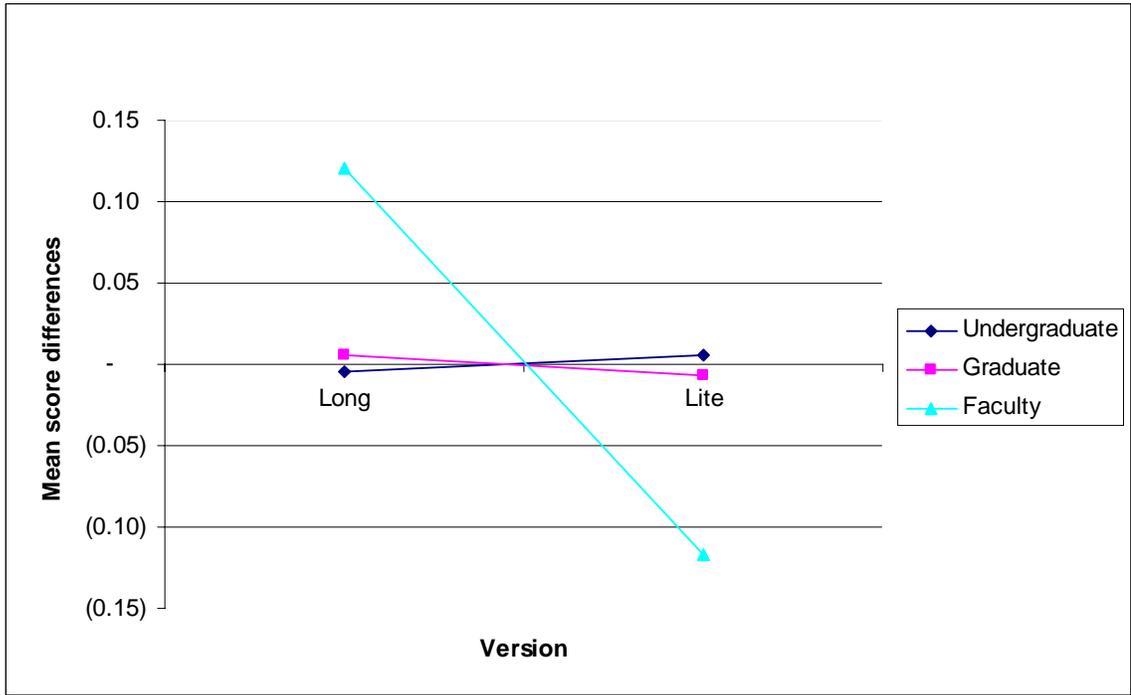


Figure 19. Interaction Effect for Library as Place Linking Item



CHAPTER 7. TABLES

Table 1. Valid surveys across the two administration formats

Lite	no	yes		no	yes	Actual	Random	Difference
Institution	N	N	Total	Percent	Percent	(Percent)	(Percent)	(Percent)
A	161	224	385	3.83	3.41	58.2	50	8.2
B	369	451	820	8.78	6.86	55.0	50	5.0
C	130	430	560	3.09	6.54	76.8	70	6.8
D	130	159	289	3.09	2.42	55.0	50	5.0
E	287	342	629	6.83	5.20	54.4	50	4.4
F	309	382	691	7.35	5.81	55.3	50	5.3
G	668	1,868	2,536	15.89	28.42	73.7	70	3.7
H	819	1,090	1,909	19.48	16.59	57.1	50	7.1
I	230	69	299	5.47	1.05	23.1	20	3.1
J	187	224	411	4.45	3.41	54.5	50	4.5
K	426	627	1,053	10.13	9.54	59.5	50	9.5
L	165	236	401	3.92	3.59	58.9	50	8.9
M	99	152	251	2.35	2.31	60.6	50	10.6
N	225	318	543	5.35	4.84	58.6	50	8.6
Total	4,205	6,572	10,777	100.00	100.00			

Table 2. Percentages of Participants Who (a) Completed the Survey and (b) Met Inclusion Criteria Across Institutions and Administration Formats

Institution	Total respondents			Valid respondents			%	%	Difference
	Long	Lite	Total	Long	Lite	Total	Long	Lite	
A	437	436	873	161	224	385	36.8%	51.4%	14.5%
B	601	613	1,214	369	451	820	61.4%	73.6%	12.2%
C	327	786	1,113	130	430	560	39.8%	54.7%	15.0%
D	252	233	485	130	159	289	51.6%	68.2%	16.7%
E	699	704	1,403	287	342	629	41.1%	48.6%	7.5%
F	605	631	1,236	309	382	691	51.1%	60.5%	9.5%
G	1,189	2,827	4,016	668	1,868	2,536	56.2%	66.1%	9.9%
H	2,337	2,402	4,739	819	1,090	1,909	35.0%	45.4%	10.3%
I	472	119	591	230	69	299	48.7%	58.0%	9.3%
J	410	408	818	187	224	411	45.6%	54.9%	9.3%
K	1,208	1,219	2,427	426	627	1,053	35.3%	51.4%	16.2%
L	496	531	1,027	165	236	401	33.3%	44.4%	11.2%
M	250	272	522	99	152	251	39.6%	55.9%	16.3%
N	749	771	1,520	225	318	543	30.0%	41.2%	11.2%
Total	10,032	11,952	21,984	4,205	6,572	10,777	41.9%	55.0%	13.1%

Table 3. Number of Comments Provided by Long and Lite Surveys

Institution	Surveys with Comments			Proportion		All Surveys			Proportion providing comments as a percent of all ...		
	Long	Lite	Total	Long	Lite	Long	Lite	Total	Long	Lite	Long > Lite
A	73	93	166	44%	56%	161	224	385	45%	42%	4%
B	147	179	326	45%	55%	369	451	820	40%	40%	0%
C	51	198	249	20%	80%	130	430	560	39%	46%	-7%
D	65	68	133	49%	51%	130	159	289	50%	43%	7%
E	93	125	218	43%	57%	287	342	629	32%	37%	-4%
F	140	152	292	48%	52%	309	382	691	45%	40%	6%
G	272	824	1096	25%	75%	668	1868	2536	41%	44%	-3%
H	266	307	573	46%	54%	819	1090	1909	32%	28%	4%
I	111	36	147	76%	24%	230	69	299	48%	52%	-4%
J	71	83	154	46%	54%	187	224	411	38%	37%	1%
K	196	268	464	42%	58%	426	627	1053	46%	43%	3%
L	80	120	200	40%	60%	165	236	401	48%	51%	-2%
M	60	106	166	36%	64%	99	152	251	61%	70%	-9%
N	122	179	301	41%	59%	225	318	543	54%	56%	-2%
Total	1747	2738	4485	39%	61%	4205	6572	10777	42%	42%	0%

Table 4. Summary Statistics for Time Spent on the Survey - Lite (including cases between 2 minutes and 2 hours only)

Survey response duration (in seconds)						
Lite						
Institution	Mean	Median	SD	Maximum	Minimum	N
A	412	295	550.45	6925	120	195
B	453	290	613.22	7078	124	443
C	412	304	472.79	7176	124	416
D	459	297	680.20	5488	127	153
E	349	259	405.52	5719	122	322
F	382	299	387.92	5246	121	359
G	376	280	381.09	4994	120	1,800
H	467	361	458.97	6364	128	1,048
I	372	306	231.42	1531	163	61
J	356	281	401.87	5038	125	215
K	427	301	546.41	6678	124	614
L	483	323	518.59	3369	127	215
M	583	356	776.38	6710	134	148
N	465	344	552.06	6815	127	291
Total	418	302	480.06	7176	120	6,280

Table 5. Summary Statistics for Time Spent on the Survey - long (including cases between 2 minutes and 2 hours only)

Survey response duration (in seconds)

Long

	Mean	Median	SD	Maximum	Minimum	N
A	556	500	290.33	2561	156	139
B	590	457	676.69	6554	135	360
C	576	473	382.73	3318	207	126
D	749	521	838.75	7117	149	127
E	658	477	654.62	5638	148	275
F	640	467	631.99	6512	171	271
G	604	455	579.96	6913	122	657
H	747	586	663.49	6994	179	775
I	595	510	392.23	4280	151	214
J	566	474	348.37	2411	127	185
K	676	498	663.22	6968	140	418
L	810	554	918.32	7185	180	150
M	673	498	571.23	3678	194	97
N	709	583	529.47	4990	160	207
Total	659	507	621.02	7185	122	4,001

Table 6. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Overall results)

	N	Mean	(SD)	95% CI for Mean		η^2
Lite						
Total Score						
no	4,047	6.979	(1.168)	6.943	7.015	0.52%
yes	6,410	6.797	(1.257)	6.766	6.827	
Total	10,457	6.867	(1.227)	6.844	6.891	
$F_{\text{calc}} = 55.05$; $df = 1/10,455$; $p_{\text{calc}} = 1.27\text{E-}13$						
Affect of Service						
no	4,036	7.262	(1.246)	7.223	7.300	0.00%
yes	6,311	7.257	(1.397)	7.222	7.291	
Total	10,347	7.259	(1.340)	7.233	7.284	
$F_{\text{calc}} = 0.032$; $df = 1/10,345$; $p_{\text{calc}} = 8.57\text{E-}01$						
Information Control						
no	4,047	7.235	(1.183)	7.198	7.271	0.71%
yes	6,398	7.013	(1.341)	6.980	7.046	
Total	10,445	7.099	(1.286)	7.074	7.123	
$F_{\text{calc}} = 74.411$; $df = 1/10,443$; $p_{\text{calc}} = 7.26\text{E-}18$						
Library as Place						
no	4,006	6.934	(1.451)	6.889	6.979	0.86%
yes	6,195	6.626	(1.719)	6.583	6.669	
Total	10,201	6.747	(1.626)	6.715	6.779	
$F_{\text{calc}} = 88.357$; $df = 1/10,199$; $p_{\text{calc}} = 6.64\text{E-}21$						
Employees who deal with users in a caring fashion						
no	3,855	7.370	(1.510)	7.322	7.418	0.01%
yes	6,167	7.335	(1.610)	7.295	7.375	
Total	10,022	7.349	(1.572)	7.318	7.379	
$F_{\text{calc}} = 1.187$; $df = 1/10,020$; $p_{\text{calc}} = 2.76\text{E-}01$						
The electronic information resources I need						
no	3,912	7.285	(1.489)	7.238	7.331	1.16%
yes	6,259	6.939	(1.597)	6.899	6.978	
Total	10,171	7.072	(1.566)	7.041	7.102	
$F_{\text{calc}} = 118.900$; $df = 1/10,169$; $p_{\text{calc}} = 1.56\text{E-}27$						
Library space that inspires study and learning						
no	3,912	6.699	(1.866)	6.640	6.757	0.27%
yes	6,075	6.496	(1.935)	6.447	6.544	
Total	9,987	6.575	(1.911)	6.538	6.613	
$F_{\text{calc}} = 26.947$; $df = 1/9,985$; $p_{\text{calc}} = 2.13\text{E-}07$						

Table 7. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution A)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	140.00	7.12	(1.08)	6.94	7.30	1.90%
yes	201.00	6.78	(1.25)	6.61	6.96	
Total	341.00	6.92	(1.19)	6.79	7.05	
F _{calc} = 6.55 ; df= 1/339 ; p _{calc} = 1.09E-02						
Affect of Service						
no	139.00	7.19	(1.22)	6.99	7.40	0.06%
yes	194.00	7.13	(1.38)	6.93	7.32	
Total	333.00	7.15	(1.31)	7.01	7.30	
F _{calc} = 0.20 ; df= 1/331 ; p _{calc} = 6.57E-01						
Information Control						
no	140.00	7.25	(1.12)	7.07	7.44	1.45%
yes	201.00	6.95	(1.33)	6.76	7.13	
Total	341.00	7.07	(1.25)	6.94	7.21	
F _{calc} = 5.00 ; df= 1/339 ; p _{calc} = 2.60E-02						
Library as Place						
no	137.00	6.72	(1.39)	6.49	6.96	3.54%
yes	189.00	6.06	(1.92)	5.78	6.33	
Total	326.00	6.33	(1.75)	6.14	6.53	
F _{calc} = 11.89 ; df= 1/324 ; p _{calc} = 6.40E-04						
Employees who deal with users in a caring fashion						
no	126.00	7.26	(1.47)	7.00	7.52	0.00%
yes	188.00	7.27	(1.50)	7.05	7.48	
Total	314.00	7.26	(1.48)	7.10	7.43	
F _{calc} = 0.00 ; df= 1/312 ; p _{calc} = 9.81E-01						
The electronic information resources I need						
no	140.00	7.46	(1.25)	7.26	7.67	3.75%
yes	198.00	6.84	(1.74)	6.60	7.09	
Total	338.00	7.10	(1.58)	6.93	7.27	
F _{calc} = 13.10 ; df= 1/336 ; p _{calc} = 3.41E-04						
Library space that inspires study and learning						
no	133.00	6.38	(1.81)	6.07	6.69	2.44%
yes	182.00	5.76	(2.00)	5.47	6.06	
Total	315.00	6.02	(1.94)	5.81	6.24	
F _{calc} = 7.82 ; df= 1/313 ; p _{calc} = 5.47E-03						

Table 8. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution B)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	366.00	6.77	(1.08)	6.66	6.88	0.54%
yes	450.00	6.60	(1.21)	6.49	6.71	
Total	816.00	6.68	(1.15)	6.60	6.76	
$F_{\text{calc}} = 4.44 ; df= 1/814 ; p_{\text{calc}} = 3.53E-02$						
Affect of Service						
no	364.00	7.22	(1.21)	7.09	7.34	0.13%
yes	441.00	7.12	(1.42)	6.99	7.25	
Total	805.00	7.16	(1.33)	7.07	7.26	
$F_{\text{calc}} = 1.02 ; df= 1/803 ; p_{\text{calc}} = 3.13E-01$						
Information Control						
no	366.00	7.25	(1.13)	7.13	7.37	0.78%
yes	447.00	7.03	(1.33)	6.91	7.15	
Total	813.00	7.13	(1.25)	7.04	7.21	
$F_{\text{calc}} = 6.36 ; df= 1/812 ; p_{\text{calc}} = 1.19E-02$						
Library as Place						
no	358.00	7.15	(1.22)	7.03	7.28	1.20%
yes	426.00	6.85	(1.52)	6.70	6.99	
Total	784.00	6.99	(1.40)	6.89	7.08	
$F_{\text{calc}} = 9.52 ; df= 1/782 ; p_{\text{calc}} = 2.10E-03$						
Employees who deal with users in a caring fashion						
no	350.00	7.39	(1.41)	7.24	7.53	0.64%
yes	429.00	7.13	(1.69)	6.97	7.29	
Total	779.00	7.25	(1.57)	7.14	7.36	
$F_{\text{calc}} = 5.00 ; df= 1/777 ; p_{\text{calc}} = 2.57E-02$						
The electronic information resources I need						
no	357.00	7.34	(1.45)	7.19	7.50	1.63%
yes	435.00	6.96	(1.55)	6.81	7.10	
Total	792.00	7.13	(1.51)	7.03	7.24	
$F_{\text{calc}} = 13.08 ; df= 1/790 ; p_{\text{calc}} = 3.17E-04$						
Library space that inspires study and learning						
no	340.00	7.09	(1.54)	6.92	7.25	1.23%
yes	415.00	6.71	(1.78)	6.54	6.89	
Total	755.00	6.88	(1.69)	6.76	7.00	
$F_{\text{calc}} = 9.34 ; df= 1/753 ; p_{\text{calc}} = 2.32E-03$						

Table 9. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution C)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	127.00	6.93	(0.89)	6.77	7.08	0.51%
yes	419.00	6.76	(1.02)	6.66	6.86	
Total	546.00	6.80	(0.99)	6.71	6.88	
F _{calc} = 2.78 ; df= 1/544 ; p _{calc} = 9.60E-02						
Affect of Service						
no	127.00	6.90	(1.02)	6.72	7.08	0.11%
yes	410.00	7.00	(1.28)	6.88	7.13	
Total	537.00	6.98	(1.22)	6.87	7.08	
F _{calc} = 0.61 ; df= 1/535 ; p _{calc} = 4.34E-01						
Information Control						
no	127.00	7.06	(0.99)	6.88	7.23	0.63%
yes	418.00	6.85	(1.13)	6.74	6.96	
Total	545.00	6.90	(1.10)	6.80	6.99	
F _{calc} = 3.47 ; df= 1/543 ; p _{calc} = 6.30E-02						
Library as Place						
no	127.00	6.72	(1.16)	6.51	6.92	1.32%
yes	419.00	6.32	(1.54)	6.17	6.46	
Total	546.00	6.41	(1.47)	6.29	6.53	
F _{calc} = 7.30 ; df= 1/544 ; p _{calc} = 7.12E-03						
Employees who deal with users in a caring fashion						
no	120.00	6.95	(1.32)	6.71	7.19	0.14%
yes	400.00	7.09	(1.63)	6.93	7.25	
Total	520.00	7.06	(1.56)	6.92	7.19	
F _{calc} = 0.72 ; df= 1/518 ; p _{calc} = 3.98E-01						
The electronic information resources I need						
no	126.00	7.23	(1.21)	7.02	7.44	2.55%
yes	408.00	6.69	(1.48)	6.54	6.83	
Total	534.00	6.82	(1.44)	6.69	6.94	
F _{calc} = 13.90 ; df= 532 ; p _{calc} = 2.13E-04						
Library space that inspires study and learning						
no	126.00	6.44	(1.57)	6.16	6.71	0.50%
yes	418.00	6.14	(1.79)	5.97	6.32	
Total	544.00	6.21	(1.75)	6.06	6.36	
F _{calc} = 2.74 ; df= 1/542 ; p _{calc} = 9.87E-02						

Table 10. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution D)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	127.00	7.16	(1.08)	6.97	7.35	0.61%
yes	155.00	6.98	(1.17)	6.79	7.17	
Total	282.00	7.06	(1.13)	6.93	7.19	
$F_{\text{calc}} = 1.72 ; df= 1/280 ; p_{\text{calc}} = 1.90\text{E-}01$						
Affect of Service						
no	127.00	7.52	(1.19)	7.31	7.73	0.53%
yes	154.00	7.33	(1.38)	7.11	7.55	
Total	281.00	7.41	(1.30)	7.26	7.57	
$F_{\text{calc}} = 1.49 ; df= 1/279 ; p_{\text{calc}} = 2.23\text{E-}01$						
Information Control						
no	127.00	7.20	(1.16)	7.00	7.41	0.09%
yes	155.00	7.13	(1.25)	6.93	7.33	
Total	282.00	7.16	(1.21)	7.02	7.31	
$F_{\text{calc}} = 0.26 ; df= 1/280 ; p_{\text{calc}} = 6.12\text{E-}01$						
Library as Place						
no	122.00	6.47	(1.48)	6.20	6.73	1.46%
yes	140.00	6.06	(1.82)	5.76	6.37	
Total	262.00	6.25	(1.68)	6.05	6.45	
$F_{\text{calc}} = 3.85 ; df= 1/260 ; p_{\text{calc}} = 5.08\text{E-}02$						
Employees who deal with users in a caring fashion						
no	122.00	7.55	(1.38)	7.30	7.80	0.00%
yes	153.00	7.56	(1.41)	7.33	7.78	
Total	275.00	7.55	(1.40)	7.39	7.72	
$F_{\text{calc}} = 0.00 ; df= 1/273 ; p_{\text{calc}} = 9.70\text{E-}01$						
The electronic information resources I need						
no	127.00	7.24	(1.40)	6.99	7.48	0.10%
yes	154.00	7.14	(1.49)	6.91	7.38	
Total	281.00	7.19	(1.45)	7.02	7.35	
$F_{\text{calc}} = 0.29 ; df= 1/279 ; p_{\text{calc}} = 5.91\text{E-}01$						
Library space that inspires study and learning						
no	113.00	6.18	(1.89)	5.83	6.53	1.09%
yes	132.00	5.76	(2.10)	5.40	6.12	
Total	245.00	5.95	(2.01)	5.70	6.20	
$F_{\text{calc}} = 2.67 ; df= 1/243 ; p_{\text{calc}} = 1.04\text{E-}01$						

Table 11. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution E)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	280.00	7.35	(1.08)	7.22	7.47	0.34%
yes	332.00	7.21	(1.14)	7.09	7.34	
Total	612.00	7.27	(1.12)	7.19	7.36	
$F_{\text{calc}} = 2.09 ; df= 1/610 ; p_{\text{calc}} = 1.49\text{E-}01$						
Affect of Service						
no	280.00	7.41	(1.16)	7.27	7.55	0.10%
yes	330.00	7.48	(1.22)	7.35	7.62	
Total	610.00	7.45	(1.19)	7.36	7.55	
$F_{\text{calc}} = 0.59 ; df= 608 ; p_{\text{calc}} = 4.41\text{E-}01$						
Information Control						
No	280.00	7.38	(1.12)	7.25	7.51	1.37%
Yes	332.00	7.09	(1.33)	6.94	7.23	
Total	612.00	7.22	(1.25)	7.12	7.32	
$F_{\text{calc}} = 8.48 ; df= 1/610 ; p_{\text{calc}} = 3.72\text{E-}03$						
Library as Place						
no	279.00	7.34	(1.37)	7.18	7.50	0.99%
yes	330.00	7.04	(1.57)	6.87	7.21	
Total	609.00	7.18	(1.49)	7.06	7.30	
$F_{\text{calc}} = 6.05 ; df= 1/607 ; p_{\text{calc}} = 1.42\text{E-}02$						
Employees who deal with users in a caring fashion						
no	266.00	7.64	(1.40)	7.47	7.81	0.00%
yes	328.00	7.63	(1.43)	7.48	7.79	
Total	594.00	7.64	(1.42)	7.52	7.75	
$F_{\text{calc}} = 0.01 ; df= 1/592 ; p_{\text{calc}} = 9.20\text{E-}01$						
The electronic information resources I need						
no	267.00	7.39	(1.46)	7.22	7.57	1.13%
yes	326.00	7.07	(1.54)	6.90	7.24	
Total	593.00	7.22	(1.51)	7.09	7.34	
$F_{\text{calc}} = 6.74 ; df= 1/591 ; p_{\text{calc}} = 9.68\text{E-}03$						
Library space that inspires study and learning						
no	277.00	7.18	(1.76)	6.97	7.39	0.24%
yes	327.00	7.01	(1.70)	6.82	7.19	
Total	604.00	7.09	(1.73)	6.95	7.23	
$F_{\text{calc}} = 1.47 ; df= 1/602 ; p_{\text{calc}} = 2.25\text{E-}01$						

Table 12. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution F)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	273.00	6.62	(1.18)	6.48	6.76	0.08%
yes	361.00	6.55	(1.20)	6.43	6.68	
Total	634.00	6.58	(1.19)	6.49	6.68	
$F_{\text{calc}} = 0.52 ; df= 1/632 ; p_{\text{calc}} = 4.72\text{E-}01$						
Affect of Service						
no	272.00	7.13	(1.24)	6.98	7.28	0.13%
yes	353.00	7.23	(1.43)	7.08	7.38	
Total	625.00	7.19	(1.35)	7.08	7.29	
$F_{\text{calc}} = 0.82 ; df= 1/623 ; p_{\text{calc}} = 3.66\text{E-}01$						
Information Control						
no	273.00	7.16	(1.21)	7.02	7.31	0.55%
yes	361.00	6.97	(1.35)	6.83	7.11	
Total	634.00	7.06	(1.29)	6.95	7.16	
$F_{\text{calc}} = 3.47 ; df= 1/632 ; p_{\text{calc}} = 6.31\text{E-}02$						
Library as Place						
no	268.00	6.89	(1.44)	6.72	7.06	1.15%
yes	344.00	6.55	(1.69)	6.37	6.73	
Total	612.00	6.70	(1.59)	6.57	6.83	
$F_{\text{calc}} = 7.09 ; df= 1/610 ; p_{\text{calc}} = 7.93\text{E-}03$						
Employees who deal with users in a caring fashion						
no	256.00	7.27	(1.49)	7.09	7.45	0.03%
yes	345.00	7.33	(1.60)	7.16	7.50	
Total	601.00	7.30	(1.55)	7.18	7.43	
$F_{\text{calc}} = 0.20 ; df= 1/599 ; p_{\text{calc}} = 6.51\text{E-}01$						
The electronic information resources I need						
no	266.00	7.21	(1.54)	7.02	7.39	0.85%
yes	356.00	6.92	(1.52)	6.76	7.08	
Total	622.00	7.04	(1.54)	6.92	7.16	
$F_{\text{calc}} = 5.30 ; df= 1/620 ; p_{\text{calc}} = 2.17\text{E-}02$						
Library space that inspires study and learning						
no	257.00	6.68	(1.78)	6.46	6.90	0.51%
yes	335.00	6.41	(1.91)	6.20	6.61	
Total	592.00	6.53	(1.86)	6.38	6.68	
$F_{\text{calc}} = 3.03 ; df= 1/590 ; p_{\text{calc}} = 8.24\text{E-}02$						

Table 13. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution G)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	667.00	6.68	(1.20)	6.59	6.77	0.01%
yes	1866.00	6.65	(1.31)	6.59	6.71	
Total	2533.00	6.66	(1.28)	6.61	6.71	
$F_{\text{calc}} = 0.19$; $df = 1/2,531$; $p_{\text{calc}} = 6.60E-01$						
Affect of Service						
no	664.00	7.09	(1.29)	6.99	7.19	0.07%
yes	1832.00	7.17	(1.43)	7.11	7.24	
Total	2496.00	7.15	(1.39)	7.10	7.21	
$F_{\text{calc}} = 1.81$; $df = 1/2,494$; $p_{\text{calc}} = 1.79E-01$						
Information Control						
no	667.00	7.27	(1.21)	7.18	7.37	0.23%
yes	1864.00	7.13	(1.34)	7.07	7.19	
Total	2531.00	7.17	(1.31)	7.12	7.22	
$F_{\text{calc}} = 5.79$; $df = 1/2,529$; $p_{\text{calc}} = 1.62E-02$						
Library as Place						
no	657.00	7.04	(1.43)	6.93	7.15	0.50%
yes	1788.00	6.78	(1.70)	6.70	6.86	
Total	2445.00	6.85	(1.63)	6.78	6.91	
$F_{\text{calc}} = 12.36$; $df = 1/2,443$; $p_{\text{calc}} = 4.47E-04$						
Employees who deal with users in a caring fashion						
no	636.00	7.16	(1.59)	7.03	7.28	0.01%
yes	1781.00	7.19	(1.65)	7.11	7.27	
Total	2417.00	7.18	(1.64)	7.12	7.25	
$F_{\text{calc}} = 0.19$; $df = 1/2,415$; $p_{\text{calc}} = 6.66E-01$						
The electronic information resources I need						
no	653.00	7.36	(1.53)	7.24	7.47	0.69%
yes	1833.00	7.06	(1.58)	6.99	7.13	
Total	2486.00	7.14	(1.57)	7.07	7.20	
$F_{\text{calc}} = 17.37$; $df = 1/2,484$; $p_{\text{calc}} = 3.19E-05$						
Library space that inspires study and learning						
no	646.00	6.85	(1.80)	6.71	6.98	0.23%
yes	1755.00	6.64	(1.91)	6.55	6.73	
Total	2401.00	6.70	(1.89)	6.62	6.77	
$F_{\text{calc}} = 5.61$; $df = 2,399$; $p_{\text{calc}} = 1.80E-02$						

Table 14. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution H)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	787.00	7.14	(1.01)	7.07	7.21	1.00%
yes	1056.00	6.91	(1.17)	6.84	6.98	
Total	1843.00	7.01	(1.11)	6.96	7.06	
$F_{\text{calc}} = 18.58 ; df= 1,841 ; p_{\text{calc}} = 1.72E-05$						
Affect of Service						
no	787.00	7.40	(1.19)	7.32	7.49	0.00%
yes	1050.00	7.40	(1.33)	7.32	7.48	
Total	1837.00	7.40	(1.27)	7.34	7.46	
$F_{\text{calc}} = 0.01 ; df= 1,835 ; p_{\text{calc}} = 9.42E-01$						
Information Control						
no	787.00	7.10	(1.12)	7.02	7.18	1.38%
yes	1055.00	6.80	(1.34)	6.72	6.88	
Total	1842.00	6.93	(1.26)	6.87	6.98	
$F_{\text{calc}} = 25.68 ; df= 1,840 ; p_{\text{calc}} = 4.43E-07$						
Library as Place						
no	785.00	6.62	(1.45)	6.52	6.73	0.99%
yes	1037.00	6.29	(1.79)	6.18	6.40	
Total	1822.00	6.43	(1.66)	6.36	6.51	
$F_{\text{calc}} = 18.16 ; df= 1/1,820 ; p_{\text{calc}} = 2.14E-05$						
Employees who deal with users in a caring fashion						
no	754.00	7.51	(1.47)	7.40	7.61	0.00%
yes	1038.00	7.49	(1.56)	7.39	7.58	
Total	1792.00	7.50	(1.52)	7.43	7.57	
$F_{\text{calc}} = 0.07 ; df= 1,790 ; p_{\text{calc}} = 7.92E-01$						
The electronic information resources I need						
no	744.00	7.15	(1.45)	7.05	7.25	1.55%
yes	1033.00	6.74	(1.69)	6.64	6.85	
Total	1777.00	6.91	(1.61)	6.84	6.99	
$F_{\text{calc}} = 27.88 ; df= 1/1,775 ; p_{\text{calc}} = 1.45E-07$						
Library space that inspires study and learning						
no	772.00	6.20	(2.00)	6.06	6.34	0.01%
yes	1021.00	6.16	(2.07)	6.03	6.29	
Total	1793.00	6.18	(2.04)	6.08	6.27	
$F_{\text{calc}} = 0.19 ; df= 1,791 ; p_{\text{calc}} = 6.61E-01$						

Table 15. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution I)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	214.00	7.93	(1.01)	7.79	8.06	0.03%
yes	61.00	7.89	(1.03)	7.62	8.15	
Total	275.00	7.92	(1.01)	7.80	8.04	
$F_{\text{calc}} = 0.09$; $df = 1/273$; $p_{\text{calc}} = 7.68E-01$						
Affect of Service						
no	214.00	7.97	(1.12)	7.82	8.13	0.10%
yes	61.00	8.06	(1.27)	7.74	8.39	
Total	275.00	7.99	(1.15)	7.86	8.13	
$F_{\text{calc}} = 0.28$; $df = 1/273$; $p_{\text{calc}} = 5.98E-01$						
Information Control						
no	214.00	8.00	(1.00)	7.87	8.14	0.03%
yes	60.00	7.96	(1.05)	7.69	8.23	
Total	274.00	7.99	(1.01)	7.87	8.11	
$F_{\text{calc}} = 0.08$; $df = 1/272$; $p_{\text{calc}} = 7.78E-01$						
Library as Place						
no	214.00	7.76	(1.25)	7.59	7.93	0.75%
yes	61.00	7.48	(1.55)	7.09	7.88	
Total	275.00	7.70	(1.32)	7.54	7.86	
$F_{\text{calc}} = 2.07$; $df = 1/273$; $p_{\text{calc}} = 1.51E-01$						
Employees who deal with users in a caring fashion						
no	213.00	8.08	(1.40)	7.89	8.26	0.00%
yes	61.00	8.08	(1.50)	7.70	8.47	
Total	274.00	8.08	(1.42)	7.91	8.25	
$F_{\text{calc}} = 0.00$; $df = 1/272$; $p_{\text{calc}} = 9.74E-01$						
The electronic information resources I need						
no	208.00	8.04	(1.40)	7.85	8.23	0.00%
yes	56.00	8.02	(1.14)	7.71	8.32	
Total	264.00	8.03	(1.34)	7.87	8.20	
$F_{\text{calc}} = 0.01$; $df = 1/262$; $p_{\text{calc}} = 9.19E-01$						
Library space that inspires study and learning						
no	212.00	7.58	(1.64)	7.35	7.80	0.61%
yes	61.00	7.26	(1.76)	6.81	7.71	
Total	273.00	7.51	(1.67)	7.31	7.70	
$F_{\text{calc}} = 1.68$; $df = 1/271$; $p_{\text{calc}} = 1.97E-01$						

Table 16. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution J)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	187.00	7.14	(1.21)	6.97	7.32	0.10%
yes	224.00	7.06	(1.22)	6.90	7.22	
Total	411.00	7.10	(1.21)	6.98	7.22	
$F_{\text{calc}} = 0.42 ; df= 1/409 ; p_{\text{calc}} = 5.17\text{E-}01$						
Affect of Service						
no	187.00	7.08	(1.33)	6.88	7.27	0.14%
yes	219.00	7.18	(1.40)	6.99	7.36	
Total	406.00	7.13	(1.37)	7.00	7.27	
$F_{\text{calc}} = 0.56 ; df= 1/404 ; p_{\text{calc}} = 4.56\text{E-}01$						
Information Control						
no	187.00	7.21	(1.28)	7.02	7.39	0.56%
yes	224.00	7.01	(1.39)	6.82	7.19	
Total	411.00	7.10	(1.34)	6.97	7.23	
$F_{\text{calc}} = 2.31 ; df= 1/409 ; p_{\text{calc}} = 1.29\text{E-}01$						
Library as Place						
no	187.00	7.23	(1.41)	7.03	7.44	0.74%
yes	221.00	6.98	(1.50)	6.78	7.18	
Total	408.00	7.10	(1.46)	6.96	7.24	
$F_{\text{calc}} = 3.04 ; df= 1/406 ; p_{\text{calc}} = 8.19\text{E-}02$						
Employees who deal with users in a caring fashion						
no	182.00	7.18	(1.65)	6.94	7.42	0.07%
yes	214.00	7.27	(1.66)	7.05	7.49	
Total	396.00	7.23	(1.65)	7.07	7.39	
$F_{\text{calc}} = 0.29 ; df= 1/394 ; p_{\text{calc}} = 5.91\text{E-}01$						
The electronic information resources I need						
no	178.00	7.07	(1.51)	6.85	7.30	0.46%
yes	215.00	6.87	(1.55)	6.66	7.07	
Total	393.00	6.96	(1.53)	6.81	7.11	
$F_{\text{calc}} = 1.80 ; df= 1/391 ; p_{\text{calc}} = 1.80\text{E-}01$						
Library space that inspires study and learning						
no	186.00	7.03	(1.72)	6.78	7.28	0.18%
yes	220.00	6.89	(1.73)	6.66	7.12	
Total	406.00	6.95	(1.73)	6.78	7.12	
$F_{\text{calc}} = 0.72 ; df= 1/404 ; p_{\text{calc}} = 3.97\text{E-}01$						

Table 17. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution K)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	420.00	6.48	(1.06)	6.37	6.58	0.06%
yes	620.00	6.42	(1.16)	6.33	6.51	
Total	1040.00	6.44	(1.12)	6.37	6.51	
$F_{\text{calc}} = 0.64$; $df = 1/1,038$; $p_{\text{calc}} = 4.23E-01$						
Affect of Service						
no	416.00	7.08	(1.17)	6.96	7.19	0.15%
yes	611.00	7.18	(1.40)	7.07	7.29	
Total	1027.00	7.14	(1.31)	7.06	7.22	
$F_{\text{calc}} = 1.57$; $df = 1/1,025$; $p_{\text{calc}} = 2.10E-01$						
Information Control						
no	420.00	7.06	(1.07)	6.96	7.16	0.49%
yes	619.00	6.89	(1.26)	6.79	6.99	
Total	1039.00	6.96	(1.19)	6.89	7.03	
$F_{\text{calc}} = 5.08$; $df = 1/1,037$; $p_{\text{calc}} = 2.45E-02$						
Library as Place						
no	416.00	6.52	(1.33)	6.39	6.65	0.72%
yes	601.00	6.26	(1.60)	6.14	6.39	
Total	1017.00	6.37	(1.50)	6.28	6.46	
$F_{\text{calc}} = 7.36$; $df = 1/1,015$; $p_{\text{calc}} = 6.80E-03$						
Employees who deal with users in a caring fashion						
no	394.00	7.21	(1.41)	7.07	7.35	0.21%
yes	591.00	7.35	(1.52)	7.23	7.47	
Total	985.00	7.29	(1.48)	7.20	7.39	
$F_{\text{calc}} = 2.06$; $df = 1/983$; $p_{\text{calc}} = 1.52E-01$						
The electronic information resources I need						
no	414.00	7.07	(1.45)	6.93	7.21	0.69%
yes	604.00	6.82	(1.48)	6.71	6.94	
Total	1018.00	6.93	(1.47)	6.83	7.02	
$F_{\text{calc}} = 7.03$; $df = 1/1,016$; $p_{\text{calc}} = 8.15E-03$						
Library space that inspires study and learning						
no	406.00	6.26	(1.74)	6.09	6.43	0.03%
yes	583.00	6.20	(1.73)	6.06	6.34	
Total	989.00	6.22	(1.73)	6.12	6.33	
$F_{\text{calc}} = 0.27$; $df = 1/987$; $p_{\text{calc}} = 6.04E-01$						

Table 18. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution L)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	209.00	7.55	(1.18)	7.39	7.71	0.05%
yes	293.00	7.61	(1.37)	7.45	7.77	
Total	502.00	7.58	(1.29)	7.47	7.70	
$F_{\text{calc}} = 0.26$; $df= 1/500$; $p_{\text{calc}} = 6.13E-01$						
Affect of Service						
no	209.00	7.53	(1.32)	7.35	7.71	0.26%
yes	292.00	7.68	(1.50)	7.51	7.86	
Total	501.00	7.62	(1.43)	7.50	7.75	
$F_{\text{calc}} = 1.32$; $df= 1/499$; $p_{\text{calc}} = 2.51E-01$						
Information Control						
no	209.00	7.59	(1.20)	7.43	7.75	0.08%
yes	291.00	7.52	(1.44)	7.35	7.68	
Total	500.00	7.55	(1.35)	7.43	7.67	
$F_{\text{calc}} = 0.38$; $df= 1/498$; $p_{\text{calc}} = 5.40E-01$						
Library as Place						
no	208.00	7.61	(1.47)	7.41	7.81	0.04%
yes	292.00	7.67	(1.67)	7.48	7.86	
Total	500.00	7.64	(1.59)	7.50	7.78	
$F_{\text{calc}} = 0.20$; $df= 1/498$; $p_{\text{calc}} = 6.51E-01$						
Employees who deal with users in a caring fashion						
no	203.00	7.53	(1.60)	7.31	7.75	0.74%
yes	288.00	7.81	(1.62)	7.62	8.00	
Total	491.00	7.69	(1.62)	7.55	7.84	
$F_{\text{calc}} = 3.65$; $df= 1/489$; $p_{\text{calc}} = 5.68E-02$						
The electronic information resources I need						
no	194.00	7.58	(1.56)	7.36	7.80	0.17%
yes	278.00	7.45	(1.68)	7.25	7.64	
Total	472.00	7.50	(1.63)	7.35	7.65	
$F_{\text{calc}} = 0.80$; $df= 1/470$; $p_{\text{calc}} = 3.71E-01$						
Library space that inspires study and learning						
no	204.00	7.65	(1.77)	7.40	7.89	0.00%
yes	289.00	7.63	(1.78)	7.43	7.84	
Total	493.00	7.64	(1.77)	7.48	7.80	
$F_{\text{calc}} = 0.01$; $df= 1/491$; $p_{\text{calc}} = 9.32E-01$						

Table 19. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution M)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	98.00	7.02	(1.22)	6.78	7.27	0.20%
yes	151.00	7.13	(1.21)	6.94	7.33	
Total	249.00	7.09	(1.22)	6.94	7.24	
$F_{\text{calc}} = 0.49$; $df = 1/247$; $p_{\text{calc}} = 4.84\text{E-}01$						
Affect of Service						
no	98.00	7.19	(1.27)	6.93	7.44	2.20%
yes	148.00	7.59	(1.38)	7.37	7.82	
Total	246.00	7.43	(1.35)	7.26	7.60	
$F_{\text{calc}} = 5.48$; $df = 1/245$; $p_{\text{calc}} = 2.00\text{E-}02$						
Information Control						
no	98.00	7.15	(1.29)	6.89	7.41	0.12%
yes	151.00	7.06	(1.36)	6.84	7.28	
Total	249.00	7.09	(1.33)	6.93	7.26	
$F_{\text{calc}} = 0.29$; $df = 1/247$; $p_{\text{calc}} = 5.93\text{E-}01$						
Library as Place						
no	96.00	6.48	(1.68)	6.14	6.82	0.00%
yes	132.00	6.46	(1.80)	6.15	6.77	
Total	228.00	6.47	(1.74)	6.24	6.70	
$F_{\text{calc}} = 0.00$; $df = 1/226$; $p_{\text{calc}} = 9.46\text{E-}01$						
Employees who deal with users in a caring fashion						
no	90.00	7.47	(1.48)	7.16	7.78	0.08%
yes	140.00	7.56	(1.67)	7.28	7.84	
Total	230.00	7.52	(1.59)	7.31	7.73	
$F_{\text{calc}} = 0.18$; $df = 1/228$; $p_{\text{calc}} = 6.75\text{E-}01$						
The electronic information resources I need						
no	96.00	7.18	(1.50)	6.87	7.48	0.26%
yes	150.00	7.02	(1.52)	6.78	7.26	
Total	246.00	7.08	(1.51)	6.89	7.27	
$F_{\text{calc}} = 0.63$; $df = 1/244$; $p_{\text{calc}} = 4.27\text{E-}01$						
Library space that inspires study and learning						
no	90.00	5.94	(2.11)	5.50	6.39	0.17%
yes	126.00	6.12	(2.06)	5.76	6.48	
Total	216.00	6.05	(2.08)	5.77	6.32	
$F_{\text{calc}} = 0.37$; $df = 1/214$; $p_{\text{calc}} = 5.44\text{E-}01$						

Table 20. ANOVAs of LibQUAL+® Total, Subscale and Linking Item Scores by Lite Form (Institution N)

	N	Mean	(SD)	95% Confidence Interval for Mean		η^2
Lite						
Total Score						
no	152.00	6.75	(1.36)	6.53	6.97	0.00%
yes	221.00	6.75	(1.36)	6.57	6.93	
Total	373.00	6.75	(1.36)	6.61	6.89	
$F_{\text{calc}} = 0.00$; $df= 1/371$; $p_{\text{calc}} = 0.97$						
Affect of Service						
no	152.00	6.91	(1.40)	6.68	7.13	0.26%
yes	216.00	7.06	(1.47)	6.86	7.25	
Total	368.00	7.00	(1.44)	6.85	7.14	
$F_{\text{calc}} = 0.97$; $df= 1/366$; $p_{\text{calc}} = 0.33$						
Information Control						
no	152.00	6.75	(1.47)	6.52	6.99	0.17%
yes	220.00	6.62	(1.51)	6.42	6.82	
Total	372.00	6.68	(1.49)	6.52	6.83	
$F_{\text{calc}} = 0.65$; $df= 1/370$; $p_{\text{calc}} = 0.42$						
Library as Place						
no	152.00	6.61	(1.69)	6.33	6.88	0.01%
yes	215.00	6.57	(1.75)	6.33	6.80	
Total	367.00	6.58	(1.73)	6.41	6.76	
$F_{\text{calc}} = 0.04$; $df= 1/365$; $p_{\text{calc}} = 0.83$						
Employees who deal with users in a caring fashion						
no	143.00	6.87	(1.68)	6.59	7.14	0.68%
yes	211.00	7.15	(1.66)	6.92	7.37	
Total	354.00	7.03	(1.67)	6.86	7.21	
$F_{\text{calc}} = 2.41$; $df= 1/352$; $p_{\text{calc}} = 0.12$						
The electronic information resources I need						
no	142.00	6.82	(1.73)	6.54	7.11	1.00%
yes	213.00	6.46	(1.77)	6.23	6.70	
Total	355.00	6.61	(1.76)	6.42	6.79	
$F_{\text{calc}} = 3.57$; $df= 1/353$; $p_{\text{calc}} = 0.06$						
Library space that inspires study and learning						
no	150.00	6.49	(2.02)	6.16	6.81	0.00%
yes	211.00	6.48	(1.95)	6.21	6.74	
Total	361.00	6.48	(1.98)	6.28	6.69	
$F_{\text{calc}} = 0.00$; $df= 1/359$; $p_{\text{calc}} = 0.97$						

Table 21. 2-Way Factorial ANOVA for Total, Dimension, and Linking Item Scores by User Group and Lite Form (All Institutions)

Source	Type III SOS	df	MS	F _{calc}	P _{calc}	Partial η^2
Dependent Variable: Total Score						
User Group	24.85	2	12.43	8.62	<0.001	0.2%
Lite	40.65	1	40.65	28.21	<0.001	0.3%
User Group X Lite	7.37	2	3.68	2.56	0.078	0.1%
Error	13,937.58	9,674	1.44			
Corrected Total	14,017.78	9,679				
Dependent Variable: Affect of Service						
User Group	158.95	2	79.48	45.25	<0.001	0.9%
Lite	0.01	1	0.01	0.01	0.934	0.0%
User Group X Lite	9.81	2	4.90	2.79	0.061	0.1%
Error	16,800.06	9,565	1.76			
Corrected Total	16,974.92	9,570				
Dependent Variable: Information Control						
User Group	38.05	2	19.03	11.78	<0.001	0.2%
Lite	55.82	1	55.82	34.55	<0.001	0.4%
User Group X Lite	12.31	2	6.15	3.81	0.022	0.1%
Error	15,615.49	9,665	1.62			
Corrected Total	15,752.84	9,670				
Dependent Variable: Library as Place						
User Group	230.61	2	115.30	45.09	<0.001	0.9%
Lite	174.46	1	174.46	68.23	<0.001	0.7%
User Group X Lite	15.65	2	7.82	3.06	0.047	0.1%
Error	24,086.37	9,420	2.56			
Corrected Total	24,526.89	9,425				

Table 21. 2-Way Factorial ANOVA for Total, Dimension, and Linking Item Scores by User Group and Lite Form (All Institutions) (cont.)

Source	Type III SOS	df	MS	F _{calc}	p _{calc}	Partial η^2
Dependent Variable: Employees who deal with users in a caring fashion						
User Group	137.54	2	68.77	28.21	<0.001	0.6%
Lite	0.27	1	0.27	0.11	0.737	0.0%
User Group X Lite	5.18	2	2.59	1.06	0.346	0.0%
Error	22,555.39	9,251	2.44			
Corrected Total	22,715.62	9,256				
Dependent Variable: The electronic information resources I need						
User Group	61.20	2	30.60	12.81	<0.001	0.3%
Lite	121.02	1	121.02	50.66	<0.001	0.5%
User Group X Lite	26.15	2	13.08	5.47	0.004	0.1%
Error	22,526.00	9,429	2.39			
Corrected Total	22,851.82	9,434				
Dependent Variable: Library space that inspires study and learning						
User Group	347.83	2	173.91	48.78	<0.001	1.0%
Lite	72.03	1	72.03	20.20	<0.001	0.2%
User Group X Lite	11.22	2	5.61	1.57	0.207	0.0%
Error	32,856.86	9,215	3.57			
Corrected Total	33,300.49	9,220				

Table 22. Descriptive Statistics for Total, Dimension, and Item Linking Scores by User Group and Lite Form (All Institutions)

	Lite	Mean	SD	N
Dependent Variable: Total				
Undergraduate	no	6.848	(1.139)	2,168
	yes	6.707	(1.252)	3,797
	Total	6.758	(1.214)	5,965
Graduate	no	6.905	(1.171)	1,019
	yes	6.824	(1.214)	1,682
	Total	6.855	(1.198)	2,701
Faculty	no	7.062	(1.078)	437
	yes	6.777	(1.179)	577
	Total	6.900	(1.145)	1,014
Total	no	6.890	(1.143)	3,624
	yes	6.746	(1.235)	6,056
	Total	6.800	(1.203)	9,680
Dependent Variable: Affect of Service				
Undergraduate	no	7.097	(1.218)	2,161
	yes	7.134	(1.403)	3,724
	Total	7.120	(1.338)	5,885
Graduate	no	7.277	(1.261)	1,015
	yes	7.371	(1.355)	1,663
	Total	7.336	(1.321)	2,678
Faculty	no	7.560	(1.171)	437
	yes	7.420	(1.328)	571
	Total	7.480	(1.264)	1,008
Total	no	7.204	(1.234)	3,613
	yes	7.228	(1.388)	5,958
	Total	7.219	(1.332)	9,571
Dependent Variable: Information Control				
Undergraduate	no	7.134	(1.149)	2,168
	yes	6.920	(1.333)	3,788
	Total	6.998	(1.273)	5,956
Graduate	no	7.157	(1.233)	1,019
	yes	7.082	(1.320)	1,682
	Total	7.110	(1.288)	2,701
Faculty	no	7.370	(1.121)	437
	yes	7.065	(1.318)	577
	Total	7.197	(1.246)	1,014
Total	no	7.169	(1.172)	3,624
	yes	6.979	(1.330)	6,047
	Total	7.050	(1.276)	9,671

Table 22. Descriptive Statistics for Total, Dimension, and Item Linking Scores by User Group and Lite Form (All Institutions) (cont.)

	Lite	Mean	SD	N
Dependent Variable: Library as Place				
Undergraduate	no	6.956	(1.387)	2,167
	yes	6.682	(1.654)	3,784
	Total	6.782	(1.568)	5,951
Graduate	no	6.699	(1.499)	1,000
	yes	6.434	(1.754)	1,555
	Total	6.538	(1.664)	2,555
Faculty	no	6.628	(1.477)	417
	yes	6.081	(1.804)	503
	Total	6.329	(1.685)	920
Total	no	6.846	(1.436)	3,584
	yes	6.565	(1.704)	5,842
	Total	6.672	(1.613)	9,426
Dependent Variable: Employees who deal with users in a caring fashion				
Undergraduate	no	7.241	(1.512)	2,064
	yes	7.200	(1.645)	3,636
	Total	7.215	(1.598)	5,700
Graduate	no	7.366	(1.507)	957
	yes	7.436	(1.568)	1,623
	Total	7.410	(1.546)	2,580
Faculty	no	7.584	(1.383)	418
	yes	7.597	(1.365)	559
	Total	7.592	(1.372)	977
Total	no	7.317	(1.500)	3,439
	yes	7.304	(1.605)	5,818
	Total	7.309	(1.567)	9,257
Dependent Variable: The electronic information resources I need				
Undergraduate	no	7.200	(1.460)	2,080
	yes	6.817	(1.599)	3,690
	Total	6.955	(1.561)	5,770
Graduate	no	7.177	(1.534)	996
	yes	7.038	(1.569)	1,663
	Total	7.090	(1.557)	2,659
Faculty	no	7.445	(1.405)	434
	yes	7.086	(1.554)	572
	Total	7.241	(1.502)	1,006
Total	no	7.224	(1.477)	3,510
	yes	6.905	(1.590)	5,925
	Total	7.023	(1.556)	9,435

Table 22. Descriptive Statistics for Total, Dimension, and Item Linking Scores by User Group and Lite Form (All Institutions) (cont.)

	Lite	Mean	SD	N
Dependent Variable: Library space that inspires study and learning				
Undergraduate	no	6.730	(1.811)	2,151
	yes	6.580	(1.874)	3,755
	Total	6.635	(1.852)	5,906
Graduate	no	6.389	(1.942)	964
	yes	6.217	(1.989)	1,499
	Total	6.284	(1.972)	2,463
Faculty	no	6.312	(1.809)	381
	yes	5.915	(1.969)	471
	Total	6.093	(1.909)	852
Total	no	6.590	(1.856)	3,496
	yes	6.430	(1.925)	5,725
	Total	6.491	(1.900)	9,221

Table 23. Difference Between Long and Lite Form for Total, Subscale, and Linking Item Scores for Various Disciplines

Disciplines	Total	Affect of Service	Inform. Control	Library as Place	AS Linking	IC Linking	LP Linking
Agriculture / Environmental Studies	0.208	0.079	0.143	0.411	-0.019	0.321	0.319
Architecture	0.233	0.142	0.261	0.264	0.204	0.313	0.317
Business	0.321	0.205	0.391	0.475	0.197	0.481	0.398
Communications / Journalism	-0.139	-0.292	0.012	0.178	-0.133	0.245	0.021
Education	0.111	0.012	0.226	0.226	0.118	0.323	0.076
Engineering / Computer Science	0.108	-0.025	0.160	0.289	-0.053	0.412	0.315
General Studies	0.273	0.755	-0.054	0.005	0.583	0.252	0.537
Health Sciences	0.075	-0.049	0.096	0.321	-0.022	0.065	0.070
Humanities	0.081	-0.158	0.195	0.310	-0.158	0.318	0.116
Law	0.188	-0.081	0.568	-0.083	-0.239	0.794	-0.234
Performing & Fine Arts	0.154	0.024	0.440	0.231	-0.036	0.602	-0.236
Science / Math	0.496	0.061	0.282	0.799	0.279	0.309	0.875
Social Sciences / Psychology	0.048	-0.059	0.131	0.549	0.013	0.229	0.467
Undecided	-0.907	-0.772	-0.431	-1.431	-0.848	-0.444	-1.185
Subjects allied to Medicine	-0.066	-0.450	0.294	0.291	-0.177	0.522	0.793
Physical Sciences	0.230	0.012	0.221	0.541	-0.460	0.607	-0.403
Social, Economic, & Political Studies	0.040	-0.326	0.053	0.332	-0.040	0.065	0.139
Business & Administrative Studies	-0.085	-0.409	0.431	-0.719	-0.176	0.106	-0.816

Table 24. Means (and Standard Deviations) for Total, Subscale and Linking Item Scores

Institutions	Lite		Total	Affect of Service	Information Control	Library as Place	AS13	IC10	LP03	N
A	no	Mean	7.12	7.19	7.25	6.72	7.26	7.46	6.38	140
		(SD)	1.08	1.22	1.12	1.39	1.47	1.25	1.81	
	yes	Mean	6.78	7.13	6.95	6.06	7.27	6.84	5.76	201
		(SD)	1.25	1.38	1.33	1.92	1.50	1.74	2.00	
B	no	Mean	6.77	7.22	7.25	7.15	7.39	7.34	7.09	366
		(SD)	1.08	1.21	1.13	1.22	1.41	1.45	1.54	
	yes	Mean	6.60	7.12	7.03	6.85	7.13	6.96	6.71	450
		(SD)	1.21	1.42	1.33	1.52	1.69	1.55	1.78	
C	no	Mean	6.93	6.90	7.06	6.72	6.95	7.23	6.44	127
		(SD)	0.89	1.02	0.99	1.16	1.32	1.21	1.57	
	yes	Mean	6.76	7.00	6.85	6.32	7.09	6.69	6.14	419
		(SD)	1.02	1.28	1.13	1.54	1.63	1.48	1.79	
D	no	Mean	7.16	7.52	7.20	6.47	7.55	7.24	6.18	127
		(SD)	1.08	1.19	1.16	1.48	1.38	1.40	1.89	
	yes	Mean	6.98	7.33	7.13	6.06	7.56	7.14	5.76	155
		(SD)	1.17	1.38	1.25	1.82	1.41	1.49	2.10	
E	no	Mean	7.35	7.41	7.38	7.34	7.64	7.39	7.18	280
		(SD)	1.08	1.16	1.12	1.37	1.40	1.46	1.76	
	yes	Mean	7.21	7.48	7.09	7.04	7.63	7.07	7.01	332
		(SD)	1.14	1.22	1.33	1.57	1.43	1.54	1.70	

Table 24. Means (and Standard Deviations) for Total, Subscale and Linking Item Scores (cont.)

Institutions	Lite		Total	Affect of Service	Information Control	Library as Place	AS13	IC10	LP03	N
F	no	Mean	6.62	7.13	7.16	6.89	7.27	7.21	6.68	273
		(SD)	1.18	1.24	1.21	1.44	1.49	1.54	1.78	
	yes	Mean	6.55	7.23	6.97	6.55	7.33	6.92	6.41	361
		(SD)	1.20	1.43	1.35	1.69	1.60	1.52	1.91	
G	no	Mean	6.68	7.09	7.27	7.04	7.16	7.36	6.85	667
		(SD)	1.20	1.29	1.21	1.43	1.59	1.53	1.80	
	yes	Mean	6.65	7.17	7.13	6.78	7.19	7.06	6.64	1866
		(SD)	1.31	1.43	1.34	1.70	1.65	1.58	1.91	
H	no	Mean	7.14	7.40	7.10	6.62	7.51	7.15	6.20	787
		(SD)	1.01	1.19	1.12	1.45	1.47	1.45	2.00	
	yes	Mean	6.91	7.40	6.80	6.29	7.49	6.74	6.16	1056
		(SD)	1.17	1.33	1.34	1.79	1.56	1.69	2.07	
I	no	Mean	7.93	7.97	8.00	7.76	8.08	8.04	7.58	214
		(SD)	1.01	1.12	1.00	1.25	1.40	1.40	1.64	
	yes	Mean	7.89	8.06	7.96	7.48	8.08	8.02	7.26	61
		(SD)	1.03	1.27	1.05	1.55	1.50	1.14	1.76	
J	no	Mean	7.14	7.08	7.21	7.23	7.18	7.07	7.03	187
		(SD)	1.21	1.33	1.28	1.41	1.65	1.51	1.72	
	yes	Mean	7.06	7.18	7.01	6.98	7.27	6.87	6.89	224
		(SD)	1.22	1.40	1.39	1.50	1.66	1.55	1.73	

Table 24. Means (and Standard Deviations) for Total, Subscale and Linking Item Scores (cont.)

Institutions	Lite		Total	Affect of Service	Information Control	Library as Place	AS13	IC10	LP03	N
K	no	Mean	6.48	7.08	7.06	6.52	7.21	7.07	6.26	420
		(SD)	1.06	1.17	1.07	1.33	1.41	1.45	1.74	
	yes	Mean	6.42	7.18	6.89	6.26	7.35	6.82	6.20	620
		(SD)	1.16	1.40	1.26	1.60	1.52	1.48	1.73	
L	no	Mean	7.55	7.53	7.59	7.61	7.53	7.58	7.65	209
		(SD)	1.18	1.32	1.20	1.47	1.60	1.56	1.77	
	yes	Mean	7.61	7.68	7.52	7.67	7.81	7.45	7.63	293
		(SD)	1.37	1.50	1.44	1.67	1.62	1.68	1.78	
M	no	Mean	7.02	7.19	7.15	6.48	7.47	7.18	5.94	98
		(SD)	1.22	1.27	1.29	1.68	1.48	1.50	2.11	
	yes	Mean	7.13	7.59	7.06	6.46	7.56	7.02	6.12	151
		(SD)	1.21	1.38	1.36	1.80	1.67	1.52	2.06	
N	no	Mean	6.75	6.91	6.75	6.61	6.87	6.82	6.49	152
		(SD)	1.36	1.40	1.47	1.69	1.68	1.73	2.02	
	yes	Mean	6.75	7.06	6.62	6.57	7.15	6.46	6.48	221
		(SD)	1.36	1.47	1.51	1.75	1.66	1.77	1.95	

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APPENDIX A: COMPARISON OF LibQUAL+® LITE AND LONG VERSION

LibQUAL+® Lite	LibQUAL+® long
Core Questions	
IC10	AS01 Employees who instill confidence in users
LP03	IC02 Making electronic resources accessible from my home or office
AS13	LP03 Library space that inspires study and learning
IC(random)	AS04 Giving users individual attention
AS(random)	IC05 A library Web site enabling me to locate information on my own
IC(random)	AS06 Employees who are consistently courteous
LP(random)	IC07 The printed library materials I need for my work
AS(random)	LP08 Quiet space for individual activities
	AS09 Readiness to respond to users' questions
	IC10 The electronic information resources I need
	AS11 Employees who have the knowledge to answer user questions
	LP12 A comfortable and inviting location
	AS13 Employees who deal with users in a caring fashion
	IC14 Modern equipment that lets me easily access needed information
	AS15 Employees who understand the needs of their users
	IC16 Easy-to-use access tools that allow me to find things on my own
	LP17 A getaway for study, learning or research
	AS18 Willingness to help users
	IC19 Making information easily accessible for independent use
	IC20 Print and/or electronic journal collections I require for my work
	LP21 Community space for group learning and group study
	AS22 Dependability in handling users' service problems
Local	
Randomly select one from the five	Option to choose five local questions
Outcomes	
Randomly select two from the five	O01 The library helps me stay abreast of developments in my field(s) of interest.
	O02 The library aids my advancement in my academic discipline or work.
	O03 The library enables me to be more efficient in my academic pursuits or work.
	O04 The library helps me distinguish between trustworthy and untrustworthy information.
	O05 The library provides me with the information skills I need in my work or study.

Satisfaction**S03**

Randomly select one from the remaining two

- | | |
|-----|---|
| S01 | In general, I am satisfied with the way in which I am treated at the library. |
| S02 | In general, I am satisfied with library support for my learning, research, and/or teaching needs. |
| S03 | How would you rate the overall quality of the service provided by the library? |
-

Library Usage

Use all three Library Usage items

- | | |
|------|--|
| LU01 | How often do you use resources on library premises? |
| LU02 | How often do you access library resources through a library Web page? |
| LU03 | How often do you use Yahoo™, Google™, or non-library gateways for information? |
-

Demographics

Items will be identical between LibQUAL+® Lite and LibQUAL+®, but will vary according to institution type

APPENDIX B: LibQUAL+® LONG VERSION AS IMPLEMENTED AT THE
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN IN 2008



**University of Illinois at Urbana-Champaign
Welcome!**

We are committed to improving your library services. Better understanding your expectations will help us tailor those services to your needs.

We are conducting this survey to measure library service quality and identify best practices through the Association of Research Libraries' LibQUAL+® program.

Please answer all items. The survey will take about **10 minutes** to complete. Thank you for your participation!

Please rate the following statements (1 is lowest, 9 is highest) by indicating:

- Minimum* -- the number that represents the *minimum* level of service that you would find acceptable
- Desired* -- the number that represents the level of service that *you personally want*
- Perceived* -- the number that represents the level of service that *you believe* our library currently provides

For each item, you must EITHER rate the item in all three columns OR identify the item as "N/A" (not applicable). Selecting "N/A" will override all other answers for that item.

When it comes to...		My Minimum Service Level Is		My Desired Service Level Is		Perceived Service Performance Is		N/A																					
		Low	High	Low	High	Low	High																						
1)	Employees who instill confidence in users	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
2)	Making electronic resources accessible from my home or office	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
3)	Library space that inspires study and learning	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
4)	Giving users individual attention	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
5)	A library Web site enabling me to locate information on my own	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
6)	<i>Availability of online help when using my library's electronic resources</i>	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
7)	Employees who are consistently courteous	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
8)	The printed library materials I need for my work	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
9)	Quiet space for individual activities	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
10)	Readiness to respond to users' questions	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
11)	The electronic information resources I need	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
12)	<i>Online course support (readings, links, references)</i>	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
13)	Employees who have the knowledge to answer user questions	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
14)	<i>Availability of subject specialist assistance</i>	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
15)	A comfortable and inviting location	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A
16)	Employees who deal with users in a caring fashion	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	N/A

17)	Modern equipment that lets me easily access needed information	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
18)	<i>Convenient service hours</i>	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
19)	Employees who understand the needs of their users	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
20)	Easy-to-use access tools that allow me to find things on my own	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
21)	A getaway for study, learning, or research	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
22)	Willingness to help users	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
23)	Making information easily accessible for independent use	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
24)	Print and/or electronic journal collections I require for my work	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
25)	Community space for group learning and group study	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
26)	<i>Access to archives, special collections</i>	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A
27)	Dependability in handling users' service problems	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	N/A

Please indicate the degree to which you agree with the following statements:										
28)	The library helps me stay abreast of developments in my field(s) of interest.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
29)	The library aids my advancement in my academic discipline or work.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
30)	The library enables me to be more efficient in my academic pursuits or work.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
31)	The library helps me distinguish between trustworthy and untrustworthy information.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
32)	The library provides me with the information skills I need in my work or study.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
33)	In general, I am satisfied with the way in which I am treated at the library.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
34)	In general, I am satisfied with library support for my learning, research, and/or teaching needs.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
35)	How would you rate the overall quality of the service provided by the library?	1	2	3	4	5	6	7	8	9
		<i>Extremely Poor</i>					<i>Extremely Good</i>			

Please indicate your library usage patterns:

36)	How often do you use resources on library premises?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never
37)	How often do you access library resources through a library Web page?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never
38)	How often do you use Yahoo(TM), Google(TM), or non-library gateways for information?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never

Please answer a few questions about yourself:

39) The library that you use most often:

- ACES
- Africana / Afro-Americana
- Applied Health Sciences
- Architecture & Art
- Asian
- Biology
- Business & Economics
- Center for Children's Books
- Chemistry
- Classics
- Communications
- Education & Social Science
- Engineering / Grainger
- English
- Geological Survey
- Geology
- Government Documents
- History, Philosophy and Newspaper
- Illinois Fire Service Institute
- Illinois History and Lincoln Collections
- Information Desk
- Interlibrary Loan and Document Delivery
- Latin American & Caribbean
- Law
- Library & Information Science
- Main Stacks / Circulation
- Map & Geography
- Mathematics
- Modern Languages & Linguistics
- Music
- Natural History Survey
- Physics / Astronomy
- Rare Book & Manuscript
- Reference
- Slavic and East European
- Sousa Archives & Center for American Music
- Undergraduate
- University Archives
- University High School
- Veterinary Medicine

40)	Age:	<input type="checkbox"/> Under 18 <input type="checkbox"/> 18 - 22 <input type="checkbox"/> 23 - 30 <input type="checkbox"/> 31 - 45 <input type="checkbox"/> 46 - 65 <input type="checkbox"/> Over 65
41)	Sex:	<input type="checkbox"/> Male <input type="checkbox"/> Female

- 42) Discipline:** ___ Administrative / Campus Unit
___ Agriculture / Environmental Studies
___ Architecture
___ Business
___ Chemical / Physical / Mathematical Sciences
___ Communications / Journalism
___ Education
___ Engineering / Computer Science
___ Humanities
___ Labor and Industrial Relations
___ Languages / Linguistics
___ Law
___ Library and Information Science
___ Life / Health Sciences
___ Other
___ Performing / Fine Arts
___ Social Sciences
___ Undecided / General Studies
___ University High School
___ Veterinary Science

43) Position:

(Select the ONE option that best describes you.)

Undergraduate: First year
 Second year
 Third year
 Fourth year
 Fifth year and above
 Non-degree

Graduate: Masters
 Doctoral
 Non-degree or Undecided

Faculty: Adjunct Faculty
 Assistant Professor
 Associate Professor
 Lecturer
 Professor
 Other Academic Status

Library Staff: Administrator
 Manager, Head of Unit
 Public Services
 Systems
 Technical Services
 Other

Staff: Research Staff
 Other staff positions

44) Please enter any comments about library services in the box below:

45) Enter your e-mail address in the box below if you would like to enter an optional drawing for a prize. Your e-mail address will be kept confidential and will not be linked to your survey responses. (Not required)

Thank you for participating in this library service quality survey!

APPENDIX C: LibQUAL+® LITE VERSION AS IMPLEMENTED AT TEXAS A&M
UNIVERSITY IN 2008



Texas A&M University, College Station

Welcome!

We are committed to improving your library services. Better understanding your expectations will help us tailor those services to your needs.

We are conducting this survey to measure library service quality and identify best practices through the Association of Research Libraries' LibQUAL+® program.

Please answer all items. The survey will take about **10 minutes** to complete. Thank you for your participation!

Please rate the following statements (1 is lowest, 9 is highest) by indicating:

Minimum -- the number that represents the *minimum* level of service that you would find acceptable

Desired -- the number that represents the level of service that *you personally want*

Perceived -- the number that represents the level of service that *you believe* our library currently provides

For each item, you must EITHER rate the item in all three columns OR identify the item as "N/A" (not applicable). Selecting "N/A" will override all other answers for that item.

When it comes to...	My Minimum Service Level Is		My Desired Service Level Is		Perceived Service Performance Is		N/A
	Low	High	Low	High	Low	High	
1) The electronic information resources I need	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
2) Library space that inspires study and learning	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
3) Employees who deal with users in a caring fashion	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
4) Modern equipment that lets me easily access needed information	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
5) Willingness to help users	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
6) Making electronic resources accessible from my home or office	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
7) A comfortable and inviting location	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
8) Dependability in handling users' service problems	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A
9) Convenient service hours	1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		1 2 3 4 5 6 7 8 9		N/A

Please indicate the degree to which you agree with the following statements:										
10)	The library helps me stay abreast of developments in my field(s) of interest.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
11)	The library helps me distinguish between trustworthy and untrustworthy information.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
12)	In general, I am satisfied with library support for my learning, research, and/or teaching needs.	1	2	3	4	5	6	7	8	9
		<i>Strongly Disagree</i>					<i>Strongly Agree</i>			
13)	How would you rate the overall quality of the service provided by the library?	1	2	3	4	5	6	7	8	9
		<i>Extremely Poor</i>					<i>Extremely Good</i>			

Please indicate your library usage patterns:

14)	How often do you use resources on library premises?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never
15)	How often do you access library resources through a library Web page?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never
16)	How often do you use Yahoo(TM), Google(TM), or non-library gateways for information?	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Never

Please answer a few questions about yourself:	
17) The library that you use most often:	<input type="checkbox"/> Evans Library & Library Annex <input type="checkbox"/> Medical Sciences Library (MSL) <input type="checkbox"/> Policy Sciences & Economics Library (PSEL) <input type="checkbox"/> West Campus Library (WCL)
18) Age:	<input type="checkbox"/> Under 18 <input type="checkbox"/> 18 - 22 <input type="checkbox"/> 23 - 30 <input type="checkbox"/> 31 - 45 <input type="checkbox"/> 46 - 65 <input type="checkbox"/> Over 65
19) Sex:	<input type="checkbox"/> Male <input type="checkbox"/> Female

- 20) Discipline:** ___ Agriculture and Life Sciences
___ Architecture
___ Business
___ Education and Human Development
___ Engineering (all areas)t
___ General Studies
___ Geosciences
___ Government & Public Service
___ Health Sciences
___ Liberal Arts / Humanities
___ Military Sciences
___ Other
___ Science (Chemistry, Math, Physics, etc.)
___ Undecided
___ Veterinary Medicine

21) Position:

(Select the ONE option that best describes you.)

Undergraduate: First year
 Second year
 Third year
 Fourth year
 Fifth year and above
 Non-degree

Graduate: Masters
 Doctoral
 Non-degree or Undecided

Faculty: Adjunct Faculty
 Assistant Professor
 Associate Professor
 Lecturer
 Professor
 Other Academic Status

Library Staff: Administrator
 Manager, Head of Unit
 Public Services
 Systems
 Technical Services
 Other

Staff: Research Staff
 Other staff positions

44) Please enter any comments about library services in the box below:

45) Enter your e-mail address in the box below if you would like to enter an optional drawing for a prize. Your e-mail address will be kept confidential and will not be linked to your survey responses. (Not required)

Thank you for participating in this library service quality survey!

APPENDIX D: SCORE ADJUSTMENT EQUATIONS

Problem statement: You have a question that is answered by respondents in the long version of the survey ($LONGX_{ij}$) and the same question answered by respondents in the Lite version ($LITEX_{ij}$). If the respondents were assigned the two forms randomly, then the long and the Lite variables potentially should have the same distribution.²²⁹ As a result we need to find a way to scale the two scores to make them comparable. The simplest scaling for converting long scores to Lite, or vice versa, is linear transformation. Linear transformations invoke additive or multiplicative constants, or both, and may change central tendency (e.g., mean) or dispersion (e.g., standard deviation) statistics, but do not alter distribution shape (i.e., skewness and kurtosis).

First Formulas (a1 and a2)

Formulas (a1) and (a2) were presented by Bruce Thompson, Martha Kyrillidou, and Colleen Cook²³⁰ in their 2009 article in *Performance Measurement and Metrics* and invoke a linear

²²⁹ In practice, the two forms may not produce equivalent scores for a variety of other reasons such as respondents being more tired, etc.

²³⁰ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "Item Sampling in Service Quality Assessment Surveys to Improve Response Rates and Reduce Respondent Burden: The LibQUAL+® Lite Example," *Performance Measurement and Metrics*, 1 (2009): 6-16.

transformation that can transform the long scores to the equivalent Lite scores, or vice versa.²³¹

(a1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form, the following formula may be used:

$$\text{LITE}\underline{X}_{ij} = \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])$$

where:

$\text{LONG}\underline{X}_{ij}$ = the score (e.g., 6.00, 7.00) of a given ith person, on any one given jth item (e.g., IC02, IC05, IC07), from a given subscale (e.g., Information Control, Library as Place), on the **long** protocol.

$\text{LONG}\underline{M}_L$ = the mean on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{M}_L$ = the mean on the **Lite** form on the linking item for a given subscale.

$\text{LONG}\underline{SD}_L$ = the standard deviation on the **long** form on the linking item for a given subscale;

$\text{LITE}\underline{SD}_L$ = the standard deviation on the **Lite** form on the linking item for a given subscale.

²³¹ Though this transformation does not ensure that the transformed distribution of X and Y will be the same, it ensures that they will have the same mean and variance.

To illustrate the formula,²³² suppose that $\underline{i} = 2$ people take the long survey and their scores are $\text{LONG}\underline{X}_{ij} = \{3, 6\}$ and $\underline{i} = 2$ people take the Lite survey and their scores are $\text{LITE}\underline{X}_{ij} = \{1, 2\}$. As a result we have:

$$\begin{array}{ll} \text{LONG}\underline{M}_L = \mathbf{4.5} & \text{LITE}\underline{M}_L = \mathbf{1.5} \\ \text{LONG}\underline{SD}_L = \mathbf{2.1213} & \text{LITE}\underline{SD}_L = \mathbf{0.7071} \end{array}$$

Now we can apply the formula on the long values to get the Lite values for the person with $\text{LONG}\underline{X}_{ij} = 3$:

$$\begin{aligned} & \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L]) \\ & \mathbf{1.5} + ([3 - \mathbf{4.5}] * [\mathbf{0.7071} / \mathbf{2.1213}]) \\ & \mathbf{1.5} + ([3 - \mathbf{4.5}] * .333) \\ & \mathbf{1.5} + ((-1.5) * .333) \\ & \mathbf{1.5} + (-.5) \\ & 1.0 \end{aligned}$$

Similarly, for $\text{LONG}\underline{X}_{ij} = 6$:

$$\begin{aligned} & \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L]) \\ & \mathbf{1.5} + ([6 - \mathbf{4.5}] * [\mathbf{0.7071} / \mathbf{2.1213}]) \\ & \mathbf{1.5} + ([6 - \mathbf{4.5}] * .333) \\ & \mathbf{1.5} + ((1.5) * .333) \end{aligned}$$

²³² Bold numbers indicate summary statistics, numbers in italics indicate raw scores.

1.5 + 0.5

2.0

(a2) To convert a score on the jth item on the Lite form for a given subscale to the jth item score on the long form, the following simple formula may be used:

$$\text{LONG}\underline{X}_{ij} = \text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L])$$

Where for $\text{LITE}\underline{X}_{ij} = 1$, the $\text{LONG}\underline{X}_{ij}$ is:

$$\text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L])$$

$$4.5 + ([1 - 1.5] * [2.1213 / 0.7071])$$

$$4.5 + ([1 - 1.5] * 3)$$

$$4.5 + ([-0.5] * 3)$$

$$4.5 + (-1.5)$$

3.0

And, similarly for $\text{LITE}\underline{X}_{ij} = 2$, the $\text{LONG}\underline{X}_{ij}$ is:

$$\text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L])$$

$$4.5 + ([2 - 1.5] * [2.1213 / 0.7071])$$

$$4.5 + ([2 - 1.5] * 3)$$

$$4.5 + ([0.5] * 3)$$

$$4.5 + (1.5)$$

6.0

Second Formulas (b1 and b2)

A second formula presented by Bruce Thompson, Martha Kyrillidou and Colleen Cook²³³ that takes into account information on all the items and does not assume that the two distributions of long and Lite have the same mean and variance is also available and listed below as (b1) and (b2). This second formula transforms the scores into standardized z scores, applies an adjustment, and then transforms back the standardized z scores into their original form.

(b1) To convert a score on the jth item on the long form for a given subscale to the jth item score on the Lite form:

$$\text{LITE}\underline{X}_{ij} = [([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_j] / \text{LONG}\underline{SD}_j) * (\text{LONG}\underline{SD}_j * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L])] + [\text{LONG}\underline{M}_j - (\text{LONG}\underline{M}_L - \text{LITE}\underline{M}_L)]$$

where:

$\text{LONG}\underline{X}_{ij}$ = the score (e.g., 6.00, 7.00) of a given ith person, on any one given jth item (e.g., IC02, IC05, IC07), from a given subscale (e.g., Information Control, Library as Place), on the **long** protocol.

$\text{LONG}\underline{M}_j$ = the mean on the **long** form on the jth item;

$\text{LONG}\underline{SD}_j$ = the standard deviation on the **long** form on the jth item;

²³³ Bruce Thompson, Martha Kyrillidou, and Colleen Cook, "Equating Scores on "Lite" and Long Library User Survey Forms: The LibQUAL+® Lite Randomized Control Trials," *Performance Measurement and Metrics* (in press).

$\underline{\text{LITE}}\underline{\text{SD}}_L$ = the standard deviation on the **Lite** form on the linking item for a given subscale;

$\underline{\text{LONG}}\underline{\text{SD}}_L$ = the standard deviation on the **long** form on the linking item for a given subscale;

$\underline{\text{LONG}}\underline{\text{M}}_L$ = the mean on the **long** form on the linking item for a given subscale;

$\underline{\text{LITE}}\underline{\text{M}}_L$ = the mean on the **Lite** form on the linking item for a given subscale.

(b2) To convert a score on the jth item on the Lite form for a given subscale to the jth item score on the long form:

$$\underline{\text{LONG}}\underline{\text{X}}_{ij} = [([\underline{\text{LITE}}\underline{\text{X}}_{ij} - \underline{\text{LITE}}\underline{\text{M}}_j] / \underline{\text{LITE}}\underline{\text{SD}}_j) * (\underline{\text{LITE}}\underline{\text{SD}}_j * [\underline{\text{LONG}}\underline{\text{SD}}_L / \underline{\text{LITE}}\underline{\text{SD}}_L])] + [\underline{\text{LITE}}\underline{\text{M}}_j - (\underline{\text{LITE}}\underline{\text{M}}_L - \underline{\text{LONG}}\underline{\text{M}}_L)]$$

To illustrate the operation of the two formulas, (b1) and (b2), we present an example with an additive constant and another example with a multiplicative constant for four hypothetical long score forms applying both formulas.

Additive constant example

Suppose we have scores for i = 4 people on a single j = 1 item on the long form such that $\underline{\text{LONG}}\underline{\text{X}}_{ij} = \{9, 8, 7, 6\}$ and scores of i = 4

people on the same $j = 1$ item on the Lite form so that $LITE\underline{X}_{ij} = \{8, 7, 6, 5\}$.

As a result we have:

$$\begin{array}{ll} \text{LONG}\underline{M}_L = 7.5 & \text{LITE}\underline{M}_L = 6.5 \\ \text{LONG}\underline{SD}_L = 1.2909 & \text{LITE}\underline{SD}_L = 1.2909 \end{array}$$

Transforming the $\text{LONG}\underline{X}_{ij} = 9$ score using formula a1 we get:

$$\begin{aligned} & \text{(a1) } \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{SD}_L / \text{LONG}\underline{SD}_L]) \\ & 6.5 + ([9 - 7.5] * [1.2909 / 1.2909]) \\ & 6.5 + ([9 - 7.5] * 1) \\ & 6.5 + (1.5 * 1) \\ & 6.5 + 1.5 \\ & 8 \end{aligned}$$

Transforming the $\text{LITE}\underline{X}_{ij} = 8$ using formula a2 we get:

$$\begin{aligned} & \text{(a2) } \text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{SD}_L / \text{LITE}\underline{SD}_L]) \\ & 7.5 + ([8 - 6.5] * [1.2909 / 1.2909]) \\ & 7.5 + ([8 - 6.5] * 1) \\ & 7.5 + (1.5 * 1) \\ & 7.5 + 1.5 \\ & 9 \end{aligned}$$

The alternative formulas (b1) and (b2) proposed by Bruce Thompson, Martha Kyrillidou, and Colleen Cook in the subsequent article in

Performance Measurement and Metrics work differently than formulas a1 and a2. If we were to transform the $_{LONG}X_{ij} = 9$ with (b1) and (b2), we would **not** expect to get $_{LITE}X_{ij} = 8$ because formula (b1) and (b2) take into account the **item** mean scores in addition to the **linking item** mean scores (linking item mean scores, $_{LONG}M_L$ and $_{LITE}M_L$, may be different from item means, $_{LONG}M_j$ and $_{LITE}M_j$) as in the following example.

From real data published from the University of Haifa, we know that the perception score on the linking item for the Information Control scale, IC10, is:

$$\begin{aligned} _{LONG}M_L &= \mathbf{7.16} & _{LITE}M_L &= \mathbf{6.76}; \\ _{LONG}SD_L &= \mathbf{1.44} & _{LITE}SD_L &= \mathbf{1.69}. \end{aligned}$$

Assuming the same raw score distributions, we have:

$$\begin{aligned} _{LONG}M_j &= \underline{7.5} & _{LITE}M_j &= \underline{6.5} \\ _{LONG}SD_j &= \underline{1.2909} & _{LITE}SD_j &= \underline{1.2909} \end{aligned}$$

If we apply these figures using formula (b1), we get:

$$\begin{aligned} (b1) & [([_{LONG}X_{ij} - _{LONG}M_j] / _{LONG}SD_j) * \\ & \quad (_{LONG}SD_j * [_{LITE}SD_L / _{LONG}SD_L])] + [_{LONG}M_j - (_{LONG}M_L - _{LITE}M_L)] \\ & [([9 - \underline{7.5}] / \underline{1.2909}) * (\underline{1.2909} * [\mathbf{1.69} / \mathbf{1.44}])] + [\underline{7.5} - (\mathbf{7.16} - \mathbf{6.76})] \\ & [([9 - \underline{7.5}] / \underline{1.2909}) * (\underline{1.2909} * [\mathbf{1.69} / \mathbf{1.44}])] + [\underline{7.5} - .40] \end{aligned}$$

$$[(9-7.5)/1.209] * (1.209 * [1.69/1.44]) + 7.10$$

$$[(9-7.5)/1.209] * (1.209 * 1.173) + 7.10$$

$$[(9-7.5)/1.209] * 1.418 + 7.10$$

$$(1.5/1.209) * 1.418 + 7.10$$

$$(1.24) * 1.418 + 7.10$$

$$1.759 + 7.10$$

$$8.85$$

Similarly if we apply these figures using formula (b2), we get:

$$(b2) \left[\left(\frac{LITE_{X_{ij}} - LITE_{M_j}}{LITE_{SD_j}} \right) * \left(LITE_{SD_j} * \left[\frac{LONG_{SD_L}}{LITE_{SD_L}} \right] \right) \right] + [LITE_{M_j} - (LITE_{M_L} - LONG_{M_L})]$$

$$[(8-6.5)/1.209] * (1.209 * [1.44/1.69]) + [6.5 - (6.76 - 7.16)]$$

$$[(8-6.5)/1.209] * (1.209 * [1.44/1.69]) + [6.5 - (-0.40)]$$

$$[(8-6.5)/1.209] * (1.209 * [1.44/1.69]) + 6.9$$

$$[(8-6.5)/1.209] * (1.209 * 0.8520) + 6.9$$

$$[(8-6.5)/1.209] * 1.03 + 6.9$$

$$(1.5/1.209) * 1.03 + 6.9$$

$$(1.24) * 1.03 + 6.9$$

$$1.27 + 6.9$$

$$8.1$$

Multiplicative constant example

We have $LONG_{X_{ij}} = \{8, 6, 4, 2\}$ and the $LITE_{X_{ij}} = \{4, 3, 2, 1\}$.

As a result we have:

$$LONG_{M_L} = 5$$

$$LITE_{M_L} = 2.5$$

$$\text{LONG}\underline{\text{SD}}_L = 2.58198 \quad \text{LITE}\underline{\text{SD}}_L = 1.29099$$

Transforming the $\text{LONG}\underline{X}_{ij} = 8$ using formula (a1) we get:

$$(a1) \text{LITE}\underline{M}_L + ([\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_L] * [\text{LITE}\underline{\text{SD}}_L / \text{LONG}\underline{\text{SD}}_L])$$

$$2.5 + ([8 - 5] * [1.29099 / 2.58198])$$

$$2.5 + ([8 - 5] * 0.5)$$

$$2.5 + (3 * 0.5)$$

$$2.5 + 1.5$$

$$4$$

Transforming the $\text{LITE}\underline{X}_{ij} = 4$ using formula (a2) we get:

$$(a2) \text{LONG}\underline{M}_L + ([\text{LITE}\underline{X}_{ij} - \text{LITE}\underline{M}_L] * [\text{LONG}\underline{\text{SD}}_L / \text{LITE}\underline{\text{SD}}_L])$$

$$5 + ([4 - 2.5] * [2.58198 / 1.29099])$$

$$5 + ([4 - 2.5] * 2.0)$$

$$5 + (1.5 * 2.0)$$

$$5 + 3$$

$$8$$

If we were to transform the $\text{LONG}\underline{X}_{ij} = 8$ using (b1) and (b2), we would **not** expect to get $\text{LITE}\underline{X}_{ij} = 4$ because formula (b1) and (b2) take into account the **item** mean scores in addition to the **linking item** mean scores (see linking item means, $\text{LONG}\underline{M}_L$ and $\text{LITE}\underline{M}_L$, may be different from item means, $\text{LONG}\underline{M}_j$ and $\text{LITE}\underline{M}_j$).

From real data published from the University of Haifa, we know that the perception score on the linking item for the Information Control scale, IC10, is:

$$\begin{aligned} \text{LONG}\underline{M}_L &= \mathbf{7.16} & \text{LITE}\underline{M}_L &= \mathbf{6.76}; \\ \text{LONG}\underline{SD}_L &= \mathbf{1.44} & \text{LITE}\underline{SD}_L &= \mathbf{1.69}. \end{aligned}$$

Assuming the same raw score distributions, we have:

$$\begin{aligned} \text{LONG}\underline{M}_j &= \underline{5} & \text{LITE}\underline{M}_j &= \underline{2.5} \\ \text{LONG}\underline{SD}_j &= \underline{2.58198} & \text{LITE}\underline{SD}_j &= \underline{1.29099} \end{aligned}$$

$$\begin{aligned} &(\text{b1}) \left[\left(\frac{[\text{LONG}\underline{X}_{ij} - \text{LONG}\underline{M}_j]}{\text{LONG}\underline{SD}_j} \right) * \right. \\ &\quad \left. \left(\text{LONG}\underline{SD}_j * \left[\frac{\text{LITE}\underline{SD}_L}{\text{LONG}\underline{SD}_L} \right] \right) \right] + [\text{LONG}\underline{M}_j - (\text{LONG}\underline{M}_L - \text{LITE}\underline{M}_L)] \\ &= \left[\frac{[8-5]}{2.58198} * (2.58198 * [1.69/1.44]) \right] + [5 - (7.16 - 6.76)] \\ &= \left[\frac{[8-5]}{2.58198} * (2.58198 * [1.69/1.44]) \right] + [5 - .40] \\ &= \left[\frac{[8-5]}{2.58198} * (2.58198 * [1.69/1.44]) \right] + 4.60 \\ &= \left[\frac{[8-5]}{2.58198} * (2.58198 * 1.1736) \right] + 4.60 \\ &= \left[\frac{[8-5]}{2.58198} * 3.0302 \right] + 4.60 \\ &= \left[\frac{3}{2.58198} * 3.0302 \right] + 4.60 \\ &= (1.1618) * 3.0302 + 4.60 \\ &= 3.5204 + 4.60 \\ &= 8.12 \end{aligned}$$

Similarly if we apply these figures onto (b2), we get:

$$\begin{aligned}
 (b2) & \left[\left(\frac{LITE\bar{X}_{ij} - LITE\bar{M}_j}{LITE\bar{SD}_j} \right) * \right. \\
 & \quad \left. (LITE\bar{SD}_j * \left[\frac{LONG\bar{SD}_L}{LITE\bar{SD}_L} \right]) \right] + [LITE\bar{M}_j - (LITE\bar{M}_L - LONG\bar{M}_L)] \\
 & [([4-2.5]/1.29099) * (1.29099 * [1.44/1.69])] + [2.5 - (6.76 - 7.16)] \\
 & [([4-2.5]/1.29099) * (1.29099 * [1.44/1.69])] + [2.5 - (-0.40)] \\
 & [([4-2.5]/1.29099) * (1.29099 * [1.44/1.69])] + 2.90] \\
 & [([4-2.5]/1.29099) * (1.29099 * 0.8520)] + 2.90] \\
 & [([4-2.5]/1.29099) * 1.10] + 2.90] \\
 & [(1.5 / 1.29099) * 1.10] + 2.90] \\
 & [1.1618 * 1.10] + 2.90] \\
 & 1.278 + 2.90 \\
 & 4.17
 \end{aligned}$$

These examples demonstrate how the two different formulas approach the information provided in the items and attempt to link the long and the Lite versions. The second formulas take into account information both in the items converted and the linking items and they assume that when converting in the direction of long to Lite, for example, we need to honor the information on the Lite form (and similarly from Lite to long, honoring the information on the long form).

Note that yet another alternative linear transformation is possible where the second formulas when converting from long to Lite honor the long item information and when converting from Lite

to long honor the Lite item information. There is not one single right method in scaling scores and judgment needs to be exercised as to what are the underlying assumptions for the different methods and what information the formula needs to honor.

Formulas b1 and b2 will work when the information on the Lite items needs to be honored but it may be problematic if the linking item information is behaving in ways that are not consistent with other item information. If there are marked differences in the scores between the linking and the converted items and especially if the differences between long and Lite move in different directions for linking and converted items, one should take that into consideration.

A variation on the second set of formulas presented below honors the information on the converted items (i.e., when converting from long to Lite honoring the long or when converting from Lite to long honoring the Lite):

$$(c1) \left[\left(\frac{LONGX_{ij} - LONGM_j}{LONGSD_j} \right) * \left(LITE SD_j * \left[\frac{LITE SD_L}{LONG SD_L} \right] \right) \right] + [LITEM_j - (LONGM_L - LITEM_L)]$$

$$(c2) \left[\left(\frac{LITEX_{ij} - LITEM_j}{LITE SD_j} \right) * \left(LONG SD_j * \left[\frac{LONG SD_L}{LITE SD_L} \right] \right) \right] + [LONGM_j - (LITEM_L - LONGM_L)]$$

Formulas c_1 and c_2 serve the purpose that the converted scores are following the direction of the converted items rather than the linking items. Whether $(b_1)/(b_2)$ or $(c_1)/(c_2)$ is preferable depends on the purposes of the conversion: is it more reasonable to have converted scores that follow the patterns of the linking items or the patterns of the converted items. The topic of item conversion is complex and this appendix serves as an illustration of the issues related to one of the simplest approaches - that of linearly transforming scores.

Formulas (b_1) and (b_2) are not intended to generalize formulas (a_1) and (a_2) . This can be seen by considering the possibility that the linking items have the same mean and standard deviation for both the long and Lite format. In this case, (b_1) and (b_2) do not apply ANY transformation, even if there are differences in the mean and variance of the j^{th} item (i.e. that item that is being transformed). They return the untransformed scores, and thus fully preserve the initial differences in the mean and variance of the j^{th} item in the two surveys.

Similarly, one can argue that formulas (c_1) and (c_2) are not a generalization of (a_1) and (a_2) . This can be seen by considering the reverse possibility of that shown in the paragraph above. In

particular, suppose that item j has the same mean and variance in the long and Lite formats, but there is a difference in the mean of the linking item across the two formats. Then, formulas (a1) and (a2) would suggest no need for any transformation, but formulas (c1) and (c2) would create a difference in the scores of item j across the two formats by adding the difference in the linking item scores. This property is also shared by formulas (b1) and (b2). However, (c1) and (c2) have the desirable property that IF there are no differences in the mean/variance of the linking items, then they collapse to formulas (a1) and (a2).

For the purposes of the LibQUAL+® Lite protocol, we deemed that **equating using these or other formulas is not needed** in the majority of the cases. In the rare cases where transformation may be needed, **the simple linear translation using formulas a1 and a2 will serve most purposes well.**

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EDUCATION

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PROFESSIONAL EXPERIENCE

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Since 1994 Martha Kyrillidou directs the activities of the ARL Statistics and Assessment capability at the Association of Research Libraries (a membership organization of over 120 of the largest research libraries in North America). Primary duties include describing and measuring the performance of research libraries and their contribution to teaching, research, scholarship and community service. Accomplishments include: in-depth analysis of large scale data sets (LibQUAL+®, DigiQUAL, MINES for Libraries™, ClimateQUAL™, ARL Statistics™, ARL Annual Salary Survey). Martha has provided leadership and sustained vision for strategic programmatic development and expansion, shifting the focus of library assessment from solely relying on expenditure-driven metrics to quality improvement to help libraries meet the increasing demands for accountability and effectiveness, relevance, impact and value; she is a prolific author and presents extensively on library assessment. She co-chairs the biennial Library Assessment Conference.