


# Relative Influence of the LibQUAL+™ Dimensions on Satisfaction: A Subgroup Analysis

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This research study investigates the influence of the identified LibQUAL+™ dimensions on various aspects of the user's satisfaction with the Academic Library at Wayne State University. Multivariate regression analysis results show statistically significant impact of LibQUAL+™ dimensions on user satisfaction. Moderated regression analysis results show the moderating impact of various demographic variables on the relationships between LibQUAL+™ dimensions and user satisfaction. The results of this research can be used to alter resource allocation expenditures to improve user satisfaction.

he changing focus of today's library requires greater understanding and responsiveness to the needs of customers or users. As Valerie Ziethaml, A. Parasuraman, and Leonard L. Berry stated, "Only customers judge quality, all other judgments are irrelevant."<sup>1</sup> To increase understanding and responsiveness by libraries, new assessment survey instruments are being developed and tested. LibQUAL+™ is one of those instruments that was approved by the Association of Research Libraries (ARL) as a membership-centered effort. LibQUAL+™ is used to determine user satisfaction with overall quality of service, satisfaction with treatment by library personnel, and satisfaction with learning, research, and teaching needs being addressed.<sup>2</sup> Using the findings from this survey instrument,

many research libraries can identify user needs and develop appropriate methods to respond to them and thereby develop a strong constituency for the library. To fully understand and utilize the LibQUAL+™ information, research libraries require detailed analysis and insight generation. One method for exploring these data is subgroup analysis, which may be useful in understanding the needs of the different constituent groups. This article presents such analysis of the LibQUAL+™ data by evaluating the relative influence of each of the four dimensions on the three identified components of user satisfaction. In addition, this study evaluates whether the relationship between these four dimensions and user satisfaction varies by various user characteristics including electronic usage, library usage, gender, and academic group.

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## Literature Review

Library research literature has begun to explore the impact of various dimensions of library operations on various elements of the perceived user satisfaction.<sup>3</sup> Four dimensions of user satisfaction have been identified by the LibQUAL+™ study, yet the relative influence of these four dimensions on overall satisfaction measures has not been studied in depth. These four dimensions are access to information, affect of service, library as a place, and personal control. It is believed that the four dimensions directly influence the level of perceived user satisfaction. Yet, how these four dimensions contribute to user satisfaction has not been fully explored.

### *LibQUAL+™*

The LibQUAL+™ instrument is a user-centric tool used by the library sector to measure and assess the performance of library organizations in the delivery of service to their users. It is based on the research and development endeavor at ARL in collaboration with the Texas A&M University.<sup>4</sup> This instrument builds on the marketing research performed by Berry, Parasuraman, and Zithaml, who developed the ServQual instrument.<sup>5</sup> The LibQUAL+™ instrument has been administered in North America as an ongoing service from ARL. The large number of ARL members that participated in this survey allows generalization and use of the information at a local level.

The LibQUAL+™ instrument has several key dimensions: access to information, affect of service, library as a place, and personal control. The dimension called access to information refers to the overall access to information at the time it is required by the user. The affect of service dimension deals with the library employees and the attention they provide the user, as well as their attitude, willingness to help, and ability to provide service. The library as a place dimension focuses on the reflective nature of the physical library facilities as they fill the requirements for studying, meeting, and contemplative

research work. And the personal control dimension refers to the ability of the user to obtain information independently with conveniently accessible tools.

### *User Characteristics*

One of the interesting aspects of research in this area is exploring the impact of the characteristics of users. Some of the user characteristics that have been studied in the past have included gender, academic groups, electronic usage, and library usage.

- *Gender:* Colleen Cook and Bruce Thompson reported that the LibQUAL+™ scores did not differ across gender.<sup>6</sup> Yet, in their survey of three libraries in Pennsylvania, Patience L. Simmonds and Syed Saad Andaleeb found that females use the library more often than males.<sup>7</sup> Steve Hiller, at the University of Washington (UW), reported that the university's internal library surveys detected gender differences whereas the LibQUAL+™ results from UW did not.<sup>8</sup> The reported difference between gender at UW was significant in the areas of computer access and library instruction. It appears from both of these studies that gender differences may occur, but results at this point do not let library researchers draw a firm conclusion. As such, gender differences represent a potential area of further exploration.

- *Academic groups:* Various academic user groups have different expectations from libraries. Eric C. Shoaf described the findings from the Brown University focus groups that indicated faculty spend less time in the library and depend less on the library for research than had been commonly believed. The study indicated that just the opposite is true for graduate students.<sup>9</sup> Hiller's results indicate that at UW, there were important differences in satisfaction between different academic groups.<sup>10</sup> Given the requirement for research among faculty and the student requirement for completing course work, one might expect that the requirements would be similar for these groups, yet

the current studies highlight different patterns of usage. This study examines these differences in detail.

- *Electronic usage:* Various studies have reported that students are using the Internet as an increasingly important source of information and prefer using online resources.<sup>11</sup> Kimberly B. Kelley and Gloria J. Orr have reported that students at The University of Maryland's University College favor the use of electronic resources and their student usage patterns are consistent with the national trends.<sup>12</sup> Hiller reported a similar pattern at UW.<sup>13</sup> The ARL statistics reported that ARL libraries are responding to the increasing demand for electronic resources by spending almost \$100 million on them. This expenditure accounted for over 12.9 percent of ARL libraries materials budgets. Further, the ARL stated that the resource allocation for electronic resources is increasing at a rapid rate.<sup>14</sup> Using structural equation modeling techniques, Anne Martensen and Lars Gronholdt developed a predictive model indicating the positive impact electronic resources had on both user satisfaction and perceived value.<sup>15</sup> Although there is a positive relationship, clearly, increasing funding for electronic resources is only one determinant of library user satisfaction.

- *Library usage:* Library usage traditionally has been tracked as a measure of performance. Yet, the performance measurement in the libraries has become more complex with the advent of electronic usage. Cook and Thompson reported that from a national perspective, the LibQUAL+™ scores did not show a difference across the participants in their frequency of library use.<sup>16</sup> Susan Edwards and Mairead Browne found that librarians underestimate the importance of user expectations about computer-based services (electronic usage) and tend to overestimate user expectations about person-to-person relationships as a key component of satisfaction with library usage.<sup>17</sup>

Studies of satisfaction by gender, academic group, electronic usage, and library usage have reported mixed results. The studies of the relationship between gender and satisfaction have produced mixed results. The report by academic groups tends to highlight the role of faculty and assume students rely on the Internet. Electronic usage and resource allocation for electronic collections is increasing, and yet, physical usage of library collections and services remains an important element of overall operations and staffing requirements of the library.

### Hypotheses Development

The hypotheses for this study deal with the perceptions of users regarding the three components of user satisfaction with libraries: the overall quality of service, satisfied with the way I am treated, and satisfied with the library support for my learning, research, and/or teaching needs. For each of the hypotheses, the main argument used is that a higher level of service provided by the library on each of the dimensions of LibQUAL+™ results in a higher level of user satisfaction across all groups. Also, the argument is made that there is an interaction effect of user characteristics on the relationship between LibQUAL+™ dimensions and user satisfaction.

- *Hypothesis 1:* Overall, the dimensions of access to information, affect of service, library as a place, and personal control are related to (1) "satisfaction with the overall quality of service provided," (2) "satisfaction with the way I am treated," and (3) "satisfaction with the library support for my learning, research, and/or teaching needs."

- *Hypothesis 2:* There will be interaction effects between the identified dimensions and gender on (1) "satisfaction with the overall quality of service provided," (2) "satisfaction with the way I am treated," and (3) "satisfaction with the library support for my needs."

- *Hypothesis 3:* There will be interaction effects between the identified

dimensions and academic groups on (1) "satisfaction with the overall quality of service provided," (2) "satisfied with the way I am treated," and (3) "satisfaction with the library support for my needs."

- *Hypothesis 4:* There will be interaction effects between the identified dimensions and library usage on (1) "satisfaction with the overall quality of service provided," (2) "satisfaction with the way I am treated," and (3) "satisfied with the library support for my needs."

- *Hypothesis 5:* There will be interaction effects between the identified dimensions and electronic usage on (1) "satisfaction with the overall quality of service provided," (2) "satisfaction with the way I am treated," and (3) "satisfaction with the library support for my needs."

### Research Method

Data from University Libraries at Wayne State University were used for this study. This university is one of the largest state-funded urban universities in Michigan and comprises five different libraries including the medical, law, engineering, undergraduate, and graduate libraries. Survey participants were asked to report their perceived level of satisfaction with the overall quality of service provided; their perceived satisfaction with the way the library supports their learning, research, or teaching needs; and their perceived satisfaction with the way they were treated. They then rated their perceived satisfaction regarding twenty-five specific questions. These questions asked participants to rate their perceived satisfaction using a Likert scale with responses ranging 1, defined as low, to 9, defined as high.

### Sample

The sample for this study included undergraduate and graduate students, faculty, and library and academic staff at Wayne State University. A total of 610 participants completed the survey. Key characteristics of the participants that were captured in this study include gen-

der, academic group, and the frequency of their use of library physical and electronic resources.

The participants who completed the study consisted of 314 (51.5%) females and 296 (48.5%) males. The academic group included 208 (34.1%) graduate and undergraduate students and 402 (65.9%) faculty and staff. The participants described their usage of the library electronic and on-premise library resources using a survey scale, which classified usage as daily (1), weekly (2), monthly (3), quarterly (4), and never (5). The median response for electronic usage of library resources was weekly (2), and the median response for on-premise library resource usage was monthly (3).

### Descriptive Statistics and Reliability

The survey used in this study was the LibQUAL+™ national survey administered by Texas A&M University and sponsored by ARL. The administering organization performed factor analysis on the entire data set and reported four dimensions. It named the dimensions access to information (AI), affect of service (AS), library as a place (LP), and personal control (PC). Reliability analysis was performed on the national sample, and Cronbach alpha was calculated for each dimension and reported.<sup>18</sup> For the entire sample, the Cronbach alpha for AS was .946, AI was .758, LP was .929, and PC was .869. To maintain consistency with the national reporting and comparability to other academic libraries, these four dimensions were used in this study. In addition, the final items reported in the original LibQUAL+™ study are used in calculating means and reliabilities for each of the dimensions in this study.

The AI dimension consists of four of the survey questions. Reliability analysis was performed using the sample of 610 respondents and a .730 alpha was calculated. The AS dimension consisted of the final seven survey items of the dimension. Reliability analysis was performed and a .928 alpha was calculated. The LP dimen-

sion consisted of the final four items and showed a reliability alpha score of .869. The PC dimension consisted of the final five items of the dimension and showed a reliability alpha score of .878. The reliability analysis is similar to the national reporting reliability analysis. To gain the improved ratings in the reliability scores of the defined dimensions, the researchers deemed that the modified items in the dimensions would be used in the subsequent subgroup moderated regression analysis.

For the independent and dependent variables used in this study, the cell means, standard deviations, and Cronbach alpha reliability scores were calculated. Table 1 presents these values for each of the survey items. The cell means for each of the dimensions ranged from 5.95 to 6.67 based on using a 9-point Likert-type scale with the value of 1 being defined as "low" and the value of 9 being defined as "high." The cell mean values for the survey items ranged from a low of 5.76 (Q#13: A place for reflection and creativity) to a high of 7.29 (Q#19: Convenient business hours). The Cronbach alphas are greater than .869 with the exception of .730 for the AI dimension. These alpha values indicate acceptable reliability for the scale items measuring each of the dimensions.<sup>19</sup>

Table 2 presents the mean scores for the three dependent variables across different levels of the user characteristic variables of gender, academic groups, library resources usage, and electronic resources usage. The first dependent variable, "Satisfied with the overall quality of service provided," scored an overall mean rating of 6.48. The mean ratings for gender groups were 6.52 for females and 6.43 for males. The mean ratings ranged from 6.36 to 6.72 for the academic groups, from 6.33 to 6.49 for the library resource usage groups and from 6.34 to 6.67 for the electronic resources usage groups. The second dependent variable, "Satisfied with library support for my learning, research, and/or teaching needs," scored an overall rating of 6.23 with a range of 6.17 to 6.29

for the gender groups, a range of 5.92 to 6.68 for the academic groups, a range of 5.91 to 6.41 for the library resource usage groups, and a range of 6.07 to 6.56 for the electronic resources usage groups. The third dependent variable, "Satisfied with the way I am treated," scored an overall rating of 6.76 with a range of 6.63 to 6.89 for the gender groups, a range of 6.56 to 7.34 for the academic groups, a range of 6.46 to 7.00 for the library resource usage groups, and a range of 6.61 to 7.13 for the electronic resources usage groups.

### *Classification*

To study the potential interaction effects of the various user characteristics and to facilitate the analysis, the user characteristic variables were recoded into two groups. The groups were logically related and of a similar size. Each group was classified as either a zero (0) or a one (1). The gender variable was divided into females and males. The female group was coded zero (0) and represents 51.5 percent of the respondents; the male group was coded one (1) and represents 48.5 percent of the respondents. The academic group variable was divided into students and faculty/staff. The student group was coded zero (0) and represents 34.1 percent of the respondents; the faculty/staff group was coded one (1) and represents 65.9 percent of the respondents. The library resource usage variable was recoded into infrequent and frequent use. The infrequent use group (monthly, quarterly, and never) was coded zero (0) and represents 52.0 percent of the respondents; the frequent use group (daily and weekly) was coded one (1) and represents 47.4 percent of the respondents. The electronic resources usage variable was divided into infrequent and frequent use. The infrequent use group (monthly, quarterly, and never) was coded zero (0) and represents 32.6 percent of the respondents; the frequent use (daily and weekly) was coded one (1) and represents 66.7 percent of the respondents.

**TABLE 1**  
**Descriptive Statistics and Reliabilities of LibQUAL+™ Dimensions**

| <b>Measurement Items</b>  | <b>Mean</b> | <b>Standard Deviation</b> | <b>Reliability (Alpha)</b> |
|---|-------------|---------------------------|----------------------------|
| Satisfied with the overall quality of the service provided                      | 6.48        | 1.59                      |                            |
| Satisfied with the way I am treated   | 6.76        | 1.76                      |                            |
| Satisfied with library support for my learning, research, and/or teaching needs | 6.23        | 1.94                      |                            |
| <b>Access to Information</b>  | 6.49        | 1.21                      | .730                       |
| 3. Complete run of journal titles   | 6.16        | 1.89                      |                            |
| 8. Timely document delivery / interlibrary loans                                | 6.44        | 1.81                      |                            |
| 9. Interdisciplinary library needs being addressed                              | 6.01        | 1.51                      |                            |
| 19. Convenient business hours   | 7.29        | 1.59                      |                            |
| 22. Comprehensive print collections   | 6.26        | 1.61                      |                            |
| <b>Affect of Service</b>  | 6.64        | 1.14                      | .928                       |
| 1. Willingness to help users  | 6.60        | 1.79                      |                            |
| 4. Employees who are consistently courteous                                     | 6.92        | 1.62                      |                            |
| 11. Dependability in handling users' service problems                           | 6.54        | 1.58                      |                            |
| 14. Giving users individual attention   | 6.46        | 1.69                      |                            |
| 15. Employees who deal with users in a caring fashion                           | 6.65        | 1.71                      |                            |
| 17. Employees who have the knowledge to answer user questions                   | 6.67        | 1.73                      |                            |
| 18. Readiness to respond to users' questions                                    | 6.79        | 2.68                      |                            |
| 20. Employees who instill confidence in users                                   | 6.40        | 2.64                      |                            |
| 24. Employees who understand the needs of their users                           | 6.57        | 1.68                      |                            |
| <b>Library as a Place</b>   | 5.95        | 1.53                      | .869                       |
| 2. Space that facilitates quiet study   | 6.15        | 1.89                      |                            |
| 10. A haven for quiet and solitude  | 6.03        | 1.85                      |                            |
| 13. A place for reflection and creativity                                       | 5.76        | 1.73                      |                            |
| 21. A comfortable and inviting location   | 6.11        | 1.87                      |                            |
| 23. A contemplative environment   | 5.90        | 1.75                      |                            |
| <b>Personal Control</b>   | 6.67        | 1.30                      | .878                       |
| 5. Making electronic resources accessible from my home or office                | 6.45        | 1.85                      |                            |
| 6. Modern equipment that lets me easily access the information I need           | 6.65        | 1.52                      |                            |
| 7. A library Web site enabling me to locate information on my own               | 6.78        | 1.65                      |                            |
| 12. Easy-to-use access tools that allow me to find things on my own             | 6.63        | 1.59                      |                            |
| 16. Making information easily accessible for independent use                    | 6.70        | 1.48                      |                            |
| 25. Convenient access to library collections                                    | 6.60        | 1.68                      |                            |

**Results**

The hypotheses were explored using the moderated regression analysis technique suggested by Leona S. Aiken and Stephen G. West<sup>20</sup> and James Jaccard, K. Wan Choi, and Robert Turrisi.<sup>21</sup> The calculated results of variance inflation factors for independent variables are less than 1.5 for the “Satisfied with the way I am treated” variable, 2.6 for the “Satisfied with library support for my needs” variable, and 2.6 for the “Overall quality of service provid-

ed” variable, showing that there should be no concern about multicollinearity.<sup>22</sup> In addition, the correlations among the mean-centered independent variables range from .575 to .707, as shown in Table 5, further indicating no presence of multicollinearity.

Because the independent variables in the model were mean centered, main effects in the model should be interpreted differently from typical regression analysis results. With the mean-centered

**TABLE 2**  
**Descriptive Statistics of User Satisfaction Measures**

| User Characteristic Variables     | Group | Frequency     | Mean   |   |                                     |
|-----------------------------------|-------|---------------|--|---|-------------------------------------|
|                                   |       |               | Satisfied with the overall quality of service provided | Satisfied with library support for my needs | Satisfied with the way I am treated |
| <b>Gender</b>                     |       | <b>100.0%</b> | <b>6.48</b>  | <b>6.23</b>                                 | <b>6.76</b>                         |
| Female                            | 0     | 51.5%         | 6.52   | 6.29  | 6.89                                |
| Male                              | 1     | 48.5%         | 6.43   | 6.17  | 6.63                                |
| <b>Academic Group</b>             |       | <b>100.0%</b> | <b>6.48</b>  | <b>6.23</b>                                 | <b>6.76</b>                         |
| Undergraduate                     | 0     | 12.8%         | 6.72   | 6.47  | 6.88                                |
| Graduate                          | 0     | 21.3%         | 6.36   | 5.92  | 6.65                                |
| Faculty                           | 1     | 47.4%         | 6.40   | 6.24  | 6.71                                |
| Library staff                     | 1     | 9.3%          | 6.61   | 6.18  | 6.56                                |
| Staff                             | 1     | 9.2%          | 6.64   | 6.68  | 7.34                                |
| <b>Library Resources Usage</b>    |       | <b>99.3%</b>  | <b>6.48</b>  | <b>6.23</b>                                 | <b>6.76</b>                         |
| Daily                             | 1     | 16.2%         | 6.44   | 5.91  | 6.46                                |
| Weekly                            | 1     | 31.1%         | 6.49   | 6.29  | 6.85                                |
| Monthly                           | 0     | 29.3%         | 6.46   | 6.20  | 6.74                                |
| Quarterly                         | 0     | 20.2%         | 6.49   | 6.41  | 6.84                                |
| Never                             | 0     | 2.5%          | 6.33   | 6.27  | 7.00                                |
| <b>Electronic Resources Usage</b> |       | <b>99.3%</b>  | <b>6.48</b>  | <b>6.23</b>                                 | <b>6.76</b>                         |
| Daily                             | 1     | 31.0%         | 6.43   | 6.15  | 6.77                                |
| Weekly                            | 1     | 35.7%         | 6.34   | 6.07  | 6.61                                |
| Monthly                           | 0     | 17.0%         | 6.67   | 6.56  | 7.13                                |
| Quarterly                         | 0     | 9.8%          | 6.66   | 6.32  | 6.67                                |
| Never                             | 0     | 5.7%          | 6.47   | 6.43  | 6.66                                |

**TABLE 3A**  
**Regression Analysis Results**

|                           | Satisfied with the overall quality of service provided |           |       |          | Satisfied with the way I am treated |           |       |          | Satisfied with library support for my needs |           |       |         |
|---------------------------|--|-----------|-------|----------|-------------------------------------|-----------|-------|----------|---|-----------|-------|---------|
|                           | B  | Std Error | Std B | t        | b                                   | Std Error | Std B | t        | b   | Std Error | Std B | T       |
| <b>Main Effects</b>       |  |           |       |          |                                     |           |       |          |   |           |       |         |
| AI: Access to Information | .155   | .056      | .118  | 2.75***  | ns                                  | ns        | ns    | ns       | .312  | .075      | .196  | 4.15*** |
| AS: Affect of Service     | .549   | .052      | .481  | 10.59*** | .962                                | .444      | .765  | 21.94*** | .513  | .069      | .370  | 7.41*** |
| LP: Library as a Place    | -.081  | .038      | -.077 | -2.14**  | ns                                  | ns        | ns    | ns       | ns  | ns        | ns    | ns      |
| PC: Personal Control      | .305   | .055      | .249  | 5.50***  | -.118                               | .040      | -.102 | -2.93*** | .221  | .073      | .148  | 3.01*** |
| F Statistic               | 174.096  |           |       |          | 310.963                             |           |       |          | 146.517                                     |           |       |         |
| Significance              | .000   |           |       |          | .000                                |           |       |          | .000  |           |       |         |
| R2                        | .535   |           |       |          | .506                                |           |       |          | .420  |           |       |         |

\* p<.10, \*\* p<.05, \*\*\* p<.01, ns = not significant

interaction effects model used in this study, the coefficient of an independent variable X1 on a dependent variable Y is interpreted as the regression of Y on X1 when all other independent variables in the regression model are at their mean value.<sup>23</sup> In other words, main effects can be interpreted as the weighted average effect across all observed values of the other predictors.<sup>24</sup>

**Regression Analysis**

Table 3a shows mean-centered regression analysis results for the three dependent variables without an interaction term. As can be seen in table 3a, the dimensions in the model provide for an R<sup>2</sup> of .535, .506, and .420 for the three dependent measures, “Satisfied with the overall quality of service provided,” “Satisfied with the way I am treated,” and “Satisfied with the library support for my needs,” respectively. The F statistics also show that all of the regression models presented are significant at the .000 level.

Hypothesis 1 deals with the main effects of the four dimensions of LibQUAL+™ on the three dependent satisfaction measures. Consistent with the study authors’ expectations, the regression analysis results in table 3a show that the AI, AS, LP, and PC dimensions influence each dependent variable differently. The AI dimension is positively related to “Satisfied with the overall quality of service” and “Satisfied with library support for my needs,” but not statistically significantly related to “Satisfied with the way I am treated.” The AS dimension is positively related to all three dependent variables. The LP dimension is related only to “Satisfied with the overall quality of service.” The PC dimension is



TABLE 3B

Moderated Regression Analysis with Gender

|                            | Satisfied with the overall quality of service provided |                |            |           | Satisfied with the way I am treated |                |            |           | Satisfied with library support for my needs |                |            |           |
|----------------------------|--|----------------|------------|-----------|-------------------------------------|----------------|------------|-----------|---|----------------|------------|-----------|
|                            | b  | Standard Error | Standard B | t         | b                                   | Standard Error | Standard B | t         | b   | Standard Error | Standard B | T         |
| <b>Main Effects</b>        |  |                |            |           |                                     |                |            |           |   |                |            |           |
| AI: Access to Information  | .145   | .055           | .111       | 2.619***  | .190                                | .078           | .131       | 2.445**   | .494  | .076           | .309       | 6.490***  |
| AS: Affect of Service      | .481   | .053           | .421       | 8.992***  | .822                                | .069           | .654       | 11.859*** | .542  | .064           | .391       | 8.427***  |
| LP: Library as a Place     | ns   | ns             | ns         | ns        | -.136                               | .042           | -.118      | -3.267*** | ns  | ns             | ns         | ns        |
| PC: Personal Control       | .308   | .055           | .252       | 5.615***  | ns                                  | ns             | ns         | ns        | ns  | ns             | ns         | ns        |
| <b>Interaction Effects</b> |  |                |            |           |                                     |                |            |           |   |                |            |           |
| AI x Gender                | ns   | ns             | ns         | ns        | -.259                               | .100           | -.491      | -2.587*** | -.313                                       | .064           | -.537      | -3.245*** |
| AS x Gender                | .148   | .049           | .316       | 3.000***  | .232                                | .098           | .449       | 2.358**   | ns  | ns             | ns         | ns        |
| LP x Gender                | -.155  | .053           | -.305      | -2.915*** | ns                                  | ns             | ns         | ns        | ns  | ns             | ns         | ns        |
| PC x Gender                | ns   | ns             | ns         | ns        | ns                                  | ns             | ns         | ns        | .307  | .093           | .543       | 3.291***  |
| F Statistic                | 140.938  |                |            |           | 127.680                             |                |            |           | 110.474                                     |                |            |           |
| Significance               | .000   |                |            |           | .000                                |                |            |           | .000  |                |            |           |
| R2                         | .538   |                |            |           | .514                                |                |            |           | .422  |                |            |           |

\* p<.10, \*\* p<.05, \*\*\* p<.01, ns = not significant

**TABLE 3C**  
**Moderated Regression Analysis with Academic Group**

|                            | Satisfied with the overall quality of service provided |                |            |          | Satisfied with the way I am treated |                |            |          | Satisfied with library support for my needs |                |            |          |
|----------------------------|--|----------------|------------|----------|-------------------------------------|----------------|------------|----------|---|----------------|------------|----------|
|                            | b  | Standard Error | Standard B | t        | b                                   | Standard Error | Standard B | t        | b   | Standard Error | Standard B | T        |
| <b>Main Effects</b>        |  |                |            |          |                                     |                |            |          |   |                |            |          |
| AI: Access to Information  | .155   | .056           | .118       | 2.75***  | ns                                  | ns             | ns         | ns       | .294  | .076           | .184       | 3.892*** |
| AS: Affect of Service      | .549   | .052           | .481       | 10.59*** | .962                                | .444           | .765       | 21.94*** | .514  | .069           | .370       | 7.440*** |
| LP: Library as a Place     |  | .038           | -.077      | -2.14**  | ns                                  | ns             | ns         | -2.93*** | ns  | ns             | ns         | ns       |
| PC: Personal Control       | .305   | .055           | .249       | 5.50***  | -.118                               | .040           | -.102      | ns       | .216  | .073           | .145       | 2.949*** |
| <b>Interaction Effects</b> |  |                |            |          |                                     |                |            |          |   |                |            |          |
| AI x Academic Group        | ns   | ns             | ns         | ns       | ns                                  | ns             | ns         | ns       | .036  | .019           | .061       | 1.920*   |
| AS x Academic Group        | ns   | ns             | ns         | ns       | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns       |
| LP x Academic Group        | ns   | ns             | ns         | ns       | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns       |
| PC x Academic Group        | ns   | ns             | ns         | ns       | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns       |
| F Statistic                | 174.096  |                |            |          | 310.963                             |                |            |          | 111.296                                     |                |            |          |
| Significance               | .000   |                |            |          | .000                                |                |            |          | .000  |                |            |          |
| R2                         | .535   |                |            |          | .506                                |                |            |          | .424  |                |            |          |

\* p<.10, \*\* p<.05, \*\*\* p<.01, ns = not significant

**TABLE 3D**  
**Moderated Regression Analysis with Library Usage**

|                            | Satisfied with the overall quality of service provided |                |            |           | Satisfied with the way I am treated |                |            |           | Satisfied with library support for my needs |                |            |         |
|----------------------------|--|----------------|------------|-----------|-------------------------------------|----------------|------------|-----------|---|----------------|------------|---------|
|                            | b  | Standard Error | Standard B | t         | b                                   | Standard Error | Standard B | t         | b   | Standard Error | Standard B | T       |
| <b>Main Effects</b>        |  |                |            |           |                                     |                |            |           |   |                |            |         |
| AI: Access to Information  | .241   | .070           | .183       | 3.422***  | ns                                  | ns             | ns         | ns        | .312  | .075           | .196       | 4.15*** |
| AS: Affect of Service      | .545   | .052           | .478       | 10.489*** | 1.005                               | .048           | .800       | 20.929*** | .513  | .069           | .370       | 7.41*** |
| LP: Library as a Place     | -.078  | .038           | -.075      | -2.069**  | -.140                               | .041           | -.122      | -3.374*** | ns  | ns             | ns         | ns      |
| PC: Personal Control       | .219   | .068           | .179       | 3.209***  | ns                                  | ns             | ns         | ns        | .221  | .073           | .148       | 3.01*** |
| <b>Interaction Effects</b> |  |                |            |           |                                     |                |            |           |   |                |            |         |
| AI x Library Usage         | -.189  | .093           | -.396      | -2.047*   | ns                                  | ns             | ns         | ns        | ns  | ns             | ns         | ns      |
| AS x Library Usage         | ns   | ns             | ns         | ns        | -.188                               | .082           | -.366      | -2.286**  | ns  | ns             | ns         | ns      |
| LP x Library Usage         | ns   | ns             | ns         | ns        | ns                                  | ns             | ns         | ns        | ns  | ns             | ns         | ns      |
| PC x Library Usage         | .193   | .090           | .415       | 2.147**   | .182                                | .081           | .355       | 2.239**   | ns  | ns             | ns         | ns      |
| F Statistic                | 116.768  |                |            |           | 156.490                             |                |            |           | 146.517                                     |                |            |         |
| Significance               | .000   |                |            |           | .000                                |                |            |           | .000  |                |            |         |
| R2                         | .539   |                |            |           | .510                                |                |            |           | .420  |                |            |         |

\* p<.10, \*\* p<.05, \*\*\* p<.01, ns = not significant

TABLE 3E

Moderated Regression Analysis with Electronic Usage

|                            | Satisfied with the overall quality of service provided |                |            |           | Satisfied with the way I am treated |                |            |          | Satisfied with library support for my needs |                |            |         |
|----------------------------|--|----------------|------------|-----------|-------------------------------------|----------------|------------|----------|---|----------------|------------|---------|
|                            | b  | Standard Error | Standard B | t         | b                                   | Standard Error | Standard B | t        | b   | Standard Error | Standard B | T       |
| <b>Main Effects</b>        |  |                |            |           |                                     |                |            |          |   |                |            |         |
| AI: Access to Information  | .159   | .056           | .121       | 2.837**   | ns                                  | ns             | ns         | ns       | .312  | .075           | .196       | 4.15*** |
| AS: Affect of Service      | .477   | .055           | .418       | 8.664***  | .962                                | .444           | .765       | 21.94*** | .513  | .069           | .370       | 7.41*** |
| LP: Library as a Place     | ns   | ns             | ns         | ns        | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns      |
| PC: Personal Control       | .310   | .055           | .253       | 5.624***  | -.118                               | .040           | -.102      | -2.93*** | .221  | .073           | .148       | 3.01*** |
| <b>Interaction Effects</b> |  |                |            |           |                                     |                |            |          |   |                |            |         |
| AI x Electronic Usage      | ns   | ns             | ns         | ns        | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns      |
| AS x Electronic Usage      | .115   | .043           | .235       | 2.663***  | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns      |
| LP x Electronic Usage      | -.139  | .046           | -.267      | -3.046*** | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns      |
| PC x Electronic Usage      | ns   | ns             | ns         | ns        | ns                                  | ns             | ns         | ns       | ns  | ns             | ns         | ns      |
| F Statistic                | 140.599  |                |            |           | 310.963                             |                |            |          | 146.517                                     |                |            |         |
| Significance               | .000   |                |            |           | .000                                |                |            |          | .000  |                |            |         |
| R2                         | .540   |                |            |           | .506                                |                |            |          | .420  |                |            |         |

\* p<.10, \*\* p<.05, \*\*\* p<.01, ns = not significant

related positively to “Satisfied with the overall quality of service” and “Satisfied with library support for my needs,” but is negatively related to “Satisfied with the way I am treated.” These results provide partial support for the first hypothesis.

Hypotheses 2 through 5 concern the interaction effects of the four user characteristics on the relationship between the four LibQUAL+™ dimensions and the dependent measures. It is hypothesized that the relationship between the four dimensions and the dependent measures will vary depending on the level of user characteristic variables. When analyzed using one of the user characteristic groups, each of the interaction effects of

the LibQUAL+™ dimensions is significant for at least one of the dependent variables. For the “Satisfied with the overall quality of service provided” dependent variable, six interaction effects (AI x Library Usage, AS x Electronic Usage, AS x Gender, LP x Electronic Usage, LP x Gender, PC x Library Usage) were significant at least at the .10 level. For the “Satisfied with the way I am treated” variable, four interaction effects (AI x Gender, AS x Gender, AS x Library Usage, PC x Library Usage) were significant at least at the .10 level. For the “Satisfied with library support for my needs” variable, three interaction effects (AI x Gender, AI x Academic Group, PC x Gender) were significant at least at the .10

**TABLE 4**  
**Hypotheses Summary**

| Hypotheses  |    | <b>A. Satisfied with the overall quality of service provided</b> | <b>B: Satisfied with the way I am treated</b> | <b>C: Satisfied with the library support for my needs</b> |
|---|----|--|---|---|
| H1: Dimensions are positively related                       | AI | Supported  | N.S.  | Supported   |
|   | AS | Supported  | Supported                                     | Supported   |
|   | LP | Supported  | N.S.  | N.S.  |
|   | PC | Supported  | Supported                                     | Supported   |
| H2: Interaction effects between dimensions & gender         | AI | N.S.   | Supported                                     | Supported   |
|   | AS | Supported  | Supported                                     | N.S.  |
|   | LP | Supported  | N.S.  | N.S.  |
|   | PC | N.S.   | N.S.  | Supported   |
| H3: Interaction effects between dimensions & academic group | AI | N.S.   | N.S.  | Supported   |
|   | AS | N.S.   | N.S.  | N.S.  |
|   | LP | N.S.   | N.S.  | N.S.  |
|   | PC | N.S.   | N.S.  | N.S.  |
| H4: Interaction effects between dimensions & library use    | AI | Supported  | N.S.  | N.S.  |
|   | AS | N.S.   | Supported                                     | N.S.  |
|   | LP | N.S.   | N.S.  | N.S.  |
|   | PC | Supported  | Supported                                     | N.S.  |
| H5: Interaction effects between dimensions & electronic use | AI | N.S.   | N.S.  | N.S.  |
|   | AS | Supported  | N.S.  | N.S.  |
|   | LP | Supported  | N.S.  | N.S.  |
|   | PC | N.S.   | N.S.  | N.S.  |
| N.S. = Not supported  |    |  |   |   |

**TABLE 5**  
**Correlation Matrix**

|   | Satisfied with the way I am treated | Satisfied with library support for my needs | Overall quality of the service provided | Access to Information | Affect of Service | Library as a Place | Personal Control |
|---|-------------------------------------|---|---|-----------------------|-------------------|--------------------|------------------|
| Satisfied with the way I am treated         | 1.000                               |   |   |                       |                   |                    |                  |
| Satisfied with library support for my needs | .684                                | 1.000                                       |   |                       |                   |                    |                  |
| Overall quality of the service provided     | .678                                | .772  | 1.000                                   |                       |                   |                    |                  |
| Access to Information                       | .504                                | .560  | .588                                    | 1.000                 |                   |                    |                  |
| Affect of Service                           | .706                                | .617  | .703                                    | .707                  | 1.000             |                    |                  |
| Library as a Place                          | .338                                | .390  | .413                                    | .567                  | .575              | 1.000              |                  |
| Personal Control                            | .528                                | .557  | .640                                    | .698                  | .737              | .590               | 1.000            |

Sig at .000

level. Table 4 provides a summary.

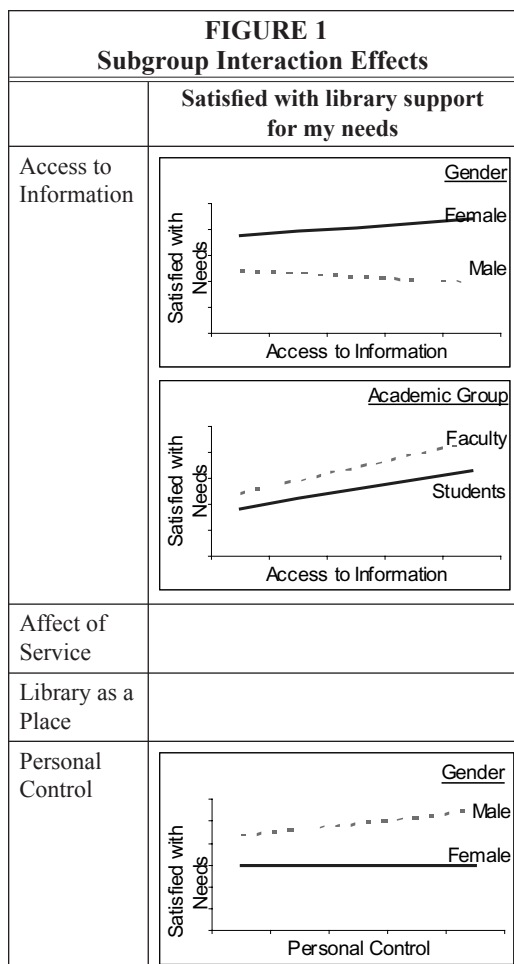
The interaction effect for gender is significant for all three dependent variables, with six of the twelve interactions significant. The interaction effect for academic group is not significant for any of the interaction effects. The interaction effect for library resource usage is significant for four of the twelve interaction equations, whereas the interaction effect for electronic resource usage is significant for only two of the twelve interaction equations.

Figure 1 displays the thirteen interaction effects by the dimension that is affected. The AI dimension details a negative interaction effect for three of the four significant interaction equations, indicating that the greater the access to information, the lower the satisfaction ratings. The AS dimension details a positive interaction effect for three of the four significant interaction equations, indicating the greater the user perception of helpful library staff, the greater the overall satisfaction ratings. The LP dimension details a negative interaction effect for two of the interaction equations, indicating that the greater the rating of the library as a quiet, reflective location, the lower the overall satisfaction ratings. The PC dimension has a positive interaction for three of the interaction equations, indicating that the greater the perceptions of personal control over obtaining information, the higher the overall satisfaction ratings.

The results from the regression analysis lend support for the interaction hypotheses. With half of the interaction equations significant for gender, it is argued that hypotheses 2a, 2b, and 2c are supported. The academic group dimension has only one significant interaction for "need." Thus, the argument is that hypotheses 3a, 3b, and 3c are not supported. The library resource usage dimension has two significant interactions for "satisfied overall" and two significant interactions for

**FIGURE 1**  
**Subgroup Interaction Effects**

|                       | Satisfied with the overall quality of service provided  | Satisfied with the way I am treated  |
|-----------------------|---|--|
| Access to Information | <p><b>Library Usage</b><br/>Infrequent<br/>Frequent<br/>Satisfied Overall<br/>Access to Information</p> | <p><b>Gender</b><br/>Female<br/>Male<br/>Satisfied with Treatment<br/>Access to Information</p>            |
| Affect of Service     | <p><b>Gender</b><br/>Male<br/>Female<br/>Satisfied Overall<br/>Affect of Service</p>                    | <p><b>Gender</b><br/>Male<br/>Female<br/>Satisfied with Treatment<br/>Affect of Service</p>                |
|                       | <p><b>Electronic Usage</b><br/>Frequent<br/>Infrequent<br/>Satisfied Overall<br/>Affect of Service</p>  | <p><b>Library Usage</b><br/>Frequent<br/>Infrequent<br/>Satisfied with Treatment<br/>Affect of Service</p> |
| Library as a Place    | <p><b>Gender</b><br/>Male<br/>Female<br/>Satisfied Overall<br/>Library as a Place</p>                   |  |
|                       | <p><b>Electronic Usage</b><br/>Infrequent<br/>Frequent<br/>Satisfied Overall<br/>Library as a Place</p> |  |
| Personal Control      | <p><b>Library Usage</b><br/>Frequent<br/>Infrequent<br/>Satisfied Overall<br/>Personal Control</p>      | <p><b>Library Usage</b><br/>Frequent<br/>Infrequent<br/>Satisfied with Treatment<br/>Personal Control</p>  |



“satisfied with treatment.” Thus, the argument is that hypotheses 4a and 4b are supported and Hypothesis 4c is not. The electronic resource usage dimension has two significant interactions for “satisfied overall,” lending support to hypothesis 5a and leading to the statement that hypotheses 5b and 5c are not supported.

**Conclusion/Discussion**

The regression equation utilizing the main effects of access to information (AI), affect of service (AS), library as a Place (LP), and personal control (PC) was significant ( $p < .01$ ) for all three dependent variables. The dependent variable of “Satisfied with the overall quality of service” utilized all

four dimensions with an  $R^2$  of .535. This indicates that utilizing these four dimensions to predict satisfaction can explain large amounts of variance in overall satisfaction. The coefficient size is noteworthy. The AS dimension has coefficients of .481, .765, and .370 for the satisfied overall, satisfied with treatment, and satisfied with support for needs dependent variables. The AS dimension is the dominant indicator for each equation. This result highlights the importance that the people working for the library operation have on user satisfaction with the service delivered by the academic library.

The library as a place (LP) dimension of this equation had a negative coefficient; however, the coefficient values were very small. Although the LP dimension had a small negative coefficient, each time it was a significant contributor to an equation. These results are not unreasonable considering the significant interaction effects and coefficient size. Upon examination of the survey questions that comprise the LP dimension, it is apparent that they focus on a quiet, reflective physical space for solitude and study while the stated

mission of the library is to provide an open gathering space for groups of students to meet. Hence, it can be theorized that the need for group and community study places is not uniform among various academic groups and disciplines. Further, the demands of the workplace in today’s environment call for teamwork and cooperation. The academic community has responded to this requirement by adding team projects and exercises to the courses to prepare students to function effectively in this environment. This shift in focus is highlighted in the use of the library as a group discussion or group meeting location. To reflect this new shift for the LP questions, the 2003 run of the



LibQUAL+™ survey was modified adjusting to the issues raised in this study. The study finding is consistent with the 2003 survey results, showing the lowest minimum mean aggregate score for the question of "Community space for group learning and group study." Further, with the advent of electronic access and the trend toward Internet use, the required reflective nature for research and study as well as required reading can take place more conveniently in the office or at home. With the shifting usage pattern, perhaps this dimension should be examined and the questions altered to reflect the team-oriented mission of the academic library.

For the dimensions of affect of service (AS) and personal control (PC), those participants who identified themselves as "frequent" electronic or library users reported higher mean overall satisfaction ratings as compared to those identified as infrequent electronic users or infrequent library users. This result leads to the conclusion that the greater the satisfaction with the control over acquiring information and the more helpful the library personnel, the greater the user satisfaction. For the access to information (AI) and library as a place (LP) dimensions, those participants who identified themselves as "frequent" electronic or library users reported lower

overall satisfaction ratings for increased dimension ratings. This result leads to the conclusion that the frequent users may be self-sufficient or frustrated with the level of support provided.

Overall, the results of this study lend support to the identified relationships reported in the literature. A more detailed analysis is argued for increasing our understanding of interaction effects of the user characteristics. Future research should further develop theoretical models and additional measures of library user satisfaction to accurately capture and assess these main interaction effects of the user characteristics and library user satisfaction.

The library management team can use the results of this study to alter resource allocation expenditures in order to improve user satisfaction. The analysis has shown that a significant component of overall satisfaction is based on the elements that contribute to the affect of service dimension. Figure 1 graphically illustrates that across all groups of the gender, electronic usage, and library usage characteristics, an increase in AS should result in an increase in overall satisfaction. As such, library personnel skill development programs and communication seminars should yield significant improvement in the user's overall satisfaction of the library.

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### Notes

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