Factors Influencing Virtual Patron Satisfaction with Online Library Resources and Services

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Abstract

College students are accessing virtual libraries whether they are on campus or learning from a distance. Academic institutions serving virtual patrons must remain focused on meeting the needs of those library users by continually examining their preferences, their searching behavior, and the information they seek. The purpose of this research was to determine if virtual patrons are satisfied with the resources and services being provided by a university's online library. Following a web-based survey, demographic characteristics of students were analyzed to determine if any influenced students' satisfaction. Using analysis of variance, correlation, and descriptive statistics, several demographic factors were found to influence student satisfaction with the library's online resources: age, gender, achieved educational level, student status, and computer experience. One factor, computer experience, was found to influence student satisfaction with the library's online services.

Overall, students reported satisfaction with the university's online library resources and services. Comments submitted to open-ended questions regarding areas for improvement to the online library provide library administrators with avenues for development to increase awareness of library services, focus improvement in navigation, and enhance student satisfaction.

Introduction

Students' demand for 24/7 access to information (Gardner & Eng, 2005), coupled with the growth in online learning (Allen & Seaman, 2008), has had a dramatic impact on the role of academic libraries. Fewer students are visiting the physical library while more are retrieving information electronically (Dilevko & Gottlieb, 2002; Moncrieff, Macauley, & Epps, 2007) as virtual patrons. Moyo (2004) identifies a virtual library patron as "one whose accesses/use of library services and resources is unbounded by space or time" (p. 188). Students' utilization of digital technology has inspired college officials to rethink services provided on-campus and off (Gardner & Eng, 2005). More recently, libraries are integrating library services with learning management systems and providing streaming video instruction (Nicholas & Tomeo, 2005). Students "no longer tie the resources traditionally associated with the library solely to its physical place" (Gardner & Eng, 2005, para. 18). Online learning now represents 3.9 million learners—20% of all U.S. students—who were taking a minimum of one online course in the fall of 2007 (Allen & Seaman, 2008).

The growth of online learning and information technology has resulted in librarians accommodating fewer materials in the physical building while providing more access to digital resources (Johnson, Trabelsi, & Fabbro, 2008). Online learning library support for virtual patrons has evolved into the digital or virtual component of the academic library (Moyo, 2004). Virtual services and resources provided by libraries generally consist of (a) reference assistance, (b) e-books, (c) electronic journals and magazines, (d) online databases, (e) an online library catalog, (f) tutorials, (g) an interlibrary loan form, (h) book delivery, (i) instant or quick search, and (j) Internet links (Blackman, 2003; De Rosa, Cantrell, Hawk, & Wilson, 2006; Moyo, 2004; Song, 2004). Rapid changes to information and communication technology have altered the information-seeking behaviors of college students (Nicholas, 2008; Williamson, Bernath, Wright, & Sullivan, 2007). Many researchers have found that a majority of students, regardless of location, prefer to access library resources online (Brandt, 2008; Kelley & Orr, 2003; Liu & Yang, 2004; Tipton, 2002). When exploring distance and traditional learners' use of libraries and information access, Brandt (2008) reported convenience as the top factor for 73% of students when choosing an information source. As the growth in online information seeking continues, along with an increase in e-learning, librarians must approach the needs of virtual patrons with a

measure of creativity and collaborative effort (Johnson, Trabelis & Fabbro, 2008; Silipigni Connaway, 2008). For example, at the Athabasca University Library Digital Reference Centre in Alberta, Canada virtual patrons may access a digital version of the library's reference collection, "including almanacs and directories, atlases and maps, data and statistics, and dictionaries and encyclopedias" (Johnson et al., 2008, p. 403). Nicholas (2008) opines the web is profoundly impacting the way virtual scholars seek, evaluate, and use information.

Many researchers concur and have investigated where students are accessing resources, and whether students are aware of online library resources (De Rosa et al., 2006; Kelley & Orr, 2003; OCLC, 2002; Stockham & Turtle, 2004). For example, the Online Computer Library Center (OCLC), (2002), investigated the needs of virtual patrons from a sample of 1,050 qualified respondents represented by 18-24 year old college students from all regions of the U.S. Among the findings, the OCLC reports 70% of students use the campus library website for assignments and learned of it through professors and teaching assistants, and from classes about using the library. Visiting the library website, most used full text journal articles (67%), the library catalog (57%), and databases (51%). However, most students also reported difficulty in finding complete articles (55%) and open-ended comments indicated issues with ease of use and access. With the explosion of resources available, the services of librarians are a key factor in meeting the needs of virtual patrons.

Changes to Academic Libraries

Researchers have conducted studies to examine the changing roles of the library, library staff, and the balancing of print journals and electronic collections with respect to the accessibility needs of virtual patrons (Hall-Ellis, 2006; Kennedy, 2005; Stephan, Cheng, & Young, 2006; Walters, 2004). Hall-Ellis (2006) notes that, "expanding access beyond the resources in local and regional collections to libraries worldwide has presented significant and unique issues to librarians" (p. 39). In a study involving 266 entry-level cataloger position announcements, Hall-Ellis found employers require one or more cataloging courses, expect librarians to be familiar with metadata schemes, and to have far more technical skills than their predecessors "to meet the challenges of an access-oriented global information environment" (p. 44).

Many elements challenge librarians to continually evaluate and update the resources and services provided in the physical library. At the same time, providing collections and services to virtual patrons requires advanced technical skills.

Virtual Library Resources and Services

Qualitative studies and questionnaires have been used to study the use of Google's Library Links program, reference services, and information literacy instruction in the virtual environment (Allen & Dee, 2006; Haya, Nygren, & Widmark, 2007; Nicholas & Tomeo, 2005; Wilson & Keys, 2004), but few have focused on meeting the needs of virtual patrons. Haya et al. (2007) studied students' experience using the search tools Google Scholar and Metalib at Uppsala University in Sweden. Undergraduate students (N = 32) searched for academic articles; half of the students received information literacy training prior to searching. Students searched with both tools for 20 minutes each. The researchers report students' retrieval of peer-reviewed articles was dramatically higher using Google Scholar with prior instruction. A questionnaire administered following the search activity indicated students found Google Scholar easier to use than Metalib. Students who received the literacy training found twice as many documents using Google Scholar. Haya et al. concluded that ease of use (usability) and prior instruction have an impact on students' success with search tools.

There have been many library studies; however, a study dedicated to determining if an institution's online library is meeting the needs of virtual patrons is not found in the literature. In this study, topics of interest to academic librarians, such as information-seeking behavior, demographic factors, and the use of virtual resources and services are incorporated by investigating students' perceptions, in terms of satisfaction, with an academic online library. Satisfaction is defined as meeting the needs of virtual patrons. In addition, results of this study build on those of previous studies which have explored demographic factors which influence virtual patrons' perceptions of libraries (Blackman, 2003; Brandt, 2008; De Rosa et al., 2006; Koohang & Ondracek, 2005).

Theoretical Framework

A central theoretical framework for this study is the technology acceptance model (TAM), one of the most cited models that permit prediction of the process of user acceptance of information systems (Davis, 1989; Park, Roman, Lee, & Chung, 2009). Based on usage of computer systems by managers and professionals, the TAM is used to predict acceptance or resistance to end-user systems. The virtual library, which is characterized by web-based technology, is a system with end users—virtual patrons—who will either accept or reject it as an information system. The TAM (Davis, 1989) establishes a user acceptance of information technology systems resulting from two constructs: (a) perceived ease of use (EOU) and (b) perceived usefulness (U).

Perceived ease of use. A major element of the TAM is the concept of perceived ease of use. Based on Bandura's (1982) self-efficacy theory, perceived ease of use is defined as "the degree to which the prospective user expects the target system to be free of effort" (Davis, Bagozzi & Warshaw, 1989, p. 985). User acceptance is higher when a system is perceived to be easier to use than another (Davis, 1989). As users perceive a system to have more relevant information to their task, the more likely they are to evaluate a system effective and easy to use (Park et al., 2009). Davis (1989) found that perceived usefulness in user adoption of a computer information system is influenced by perceived ease of use which translates into both the attitude towards and intention to use a particular system.

Perceived usefulness. Perceived usefulness is defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). User belief in the usefulness of a system may be affected by the power of the technology or the degree to which it improves productivity (Davis et al., 1989). Cheung and Huang (2005) examined undergraduates' Internet usage and distance learning in Hong Kong and found skills in the use of the Internet positively correlated with perceived usefulness and enjoyment. Specifically, Internet skills positively correlated with perceived usefulness, perceived enjoyment, general learning, distance learning, and constructive learning. Acceptance of the technology (the virtual resources or the Internet) is achieved based on satisfaction resulting from perceived ease of use and usefulness.

Acceptance and satisfaction. Acceptance of an information system results when a user finds a system useful and easy to use to the extent it offers significant performance gains (Davis et.al.,

1989). The TAM provides a framework for determining students' satisfaction with the resources and services of a virtual library. In this study, satisfaction or acceptance equates to meeting the needs of virtual patrons accessing the online library's resources and services. Therefore, when applying the TAM, it is predicted that students who are more satisfied with the resources and services of the online library have achieved acceptance (satisfaction) of the information system.

Statement of the Problem

Meeting the needs of virtual patrons in the academic library has become highly complex with the acceleration of information sources available through the Internet and changes in the behavior of library users (Moyo, 2004). There is little known about virtual patrons'–those who may or may not visit the campus–satisfaction with the online resources and services being provided by the academic library. Therefore, it is not known whether the information needs of virtual patrons are being met. Library administrators may use this information to pursue corrective steps as needed to improve ease of use and usefulness to resources within the virtual library environment. Improvements may help support online learners in accordance with Sloan-C's five pillars of online education (Moore, 2008) and meet student demand for 24/7 access to information (Gardner & Eng, 2005).

Research Questions and Purpose of the Study

Based on a review of the relevant literature, a set of research questions were generated. These questions are:

1. How do online library resources satisfy virtual patrons?
2. How do online library services satisfy virtual patrons?
3. How do demographic factors influence virtual patron satisfaction with the resources provided by the online library?
4. How do demographic factors influence virtual patron satisfaction with the services provided by the online library?

The proliferation of electronic services and resources provided by academic libraries and those available through search engines are having an impact on students' use of information sources. There has been considerable exploration of a variety of library related resources and services; however, none have addressed the satisfaction of college students as virtual patrons. The purpose of this research was to determine virtual patrons' satisfaction with the online resources

and services available through a northwest Florida university's academic library. Satisfaction is measured in terms of meeting the needs of virtual patrons. An additional purpose was to identify which demographic factors influence satisfaction with those online library resources and services.

Significance

Study results may assist library administrators addressing students' use of virtual library services and resources in the academic environment. Since students prefer to access information online (De Rosa et al., 2006), student satisfaction with the online library is important. Findings from a survey of a sample of undergraduate and graduate students who are accessing the online components of the academic library at a northwest Florida university may be generalized to the population at the study institution.

Academic librarians may study the results when examining strategies for the development or improvement of online library services and resources for students. Gaining a better understanding of the virtual patron experience may help librarians make informed decisions about how to integrate online library tools, inform strategic planning, and determine if the academic library is meeting the needs of virtual patrons. In this study, the researcher explored which demographic factors influence student satisfaction with the online resources and services available through the university library.

Research Design

The research methodology for determining students' satisfaction with online library resources and services was survey research. The web-based survey was designed to capture students' satisfaction with the resources and services of an online academic library.

Population and Sample

All undergraduate and graduate students enrolled at a northwest Florida university during the Spring 2010 Semester, taking at least one online class, comprised the population for this study. Based on the Survey System's Sample Size Calculator (Creative Research Systems, 2009) and

the historical response rate of a similar web-based survey, a sample of 1,500 students was considered appropriate for the student population being studied. Limitations enabled within Survey Monkey (Finley, 2009), a web-based survey tool, prevented students from completing the survey more than once from a specific Internet protocol (IP) address. A list management tool allowed for follow-up message requests for participation.

In this study, the population is defined as undergraduate and graduate students taking a minimum of one online class at a northwest Florida university. Demographic questions determined student status. Stratified convenience random sampling was used to gain a representative list of graduate and undergraduate students. The most current enrollment figures indicate a student population comprising 85% undergraduate students and 15% graduate (UWF, 2009b). A stratified random list of students was generated with assistance from the university's online campus. The list included names and e-mail addresses for the population of 5,454 students enrolled in at least one online course during the Spring 2010 term.

Nonresponse error. Nonresponse error is defined by Dillman and Bowker (2001) as "the result of nonresponse from people in the sample, who, if they had responded, would have provided different answers to the survey questions than those who did respond to the survey" (p. 2). Specifically, Dillman and Bowker observed the following problems associated with nonresponse to web surveys:

- People who lack computer experience do not know how to provide and erase certain answers (e.g., radio buttons, which require clicking on a different answer choice vs. HTML boxes which require reclicking the same box).
- Not knowing what to do with a drop-down menu.
- Not being able to see all of the answer choices without scrolling the page up and down.
- Being forced to answer every question, even when none of the answer choices seemed appropriate.
- Being able to see only one question at a time, so that when their concentration is interrupted they have to figure out how to go back and see a question in order to answer the current one.

- Having to take multiple actions to answer each question (e.g., clicking on an answer choice, moving to the scroll bar in order to reveal a *click for next page instruction*, and then clicking on that instruction to make the next question appear). (p. 6)

For this study's instrument, instructions were provided at the top of each page and section. Pages were designed for students to toggle back and forth to view previously answered questions. There were two open-ended questions for which an answer was not required; however, the remaining questions required a response. The final survey question instructed students to enter an e-mail address to be included in the random incentive drawing.

Measurement error. Measurement error is described by Dillman and Bowker (2001) as "the result of inaccurate responses that stem from poor question wording, poor interviewing, survey mode effects and/or some aspect of the respondent's behavior" (p. 2). Several avenues to eliminate measurement error were addressed for this study. First, the questionnaire was tested for reliability, validity, and clarity. The instrument was also used successfully in a previous study (Blackman, 2003). Additionally, question items were revised following feedback from a group of undergraduate and graduate students ($N = 55$) who were invited to make critical comments regarding question and instrument construction. And, finally, several recommendations by Dillman and Bowker to eliminate unintended measurement effects were incorporated. These recommendations were

- Adjusting for screen configurations so that viewers see an equal delivery of item stimuli,
- Using color to maximize readability, and
- Providing navigation buttons and prompts.

The survey was designed with color and shading to increase readability, and navigation buttons gave users instruction on how to proceed through the survey. In addition, students who skipped survey questions which required an answer were prompted with a text message. There was also an exit button available on each page if a student wished not to participate at any time during the survey.

Instrumentation

Distance Library Services Survey. Blackman (2003) created the Distance Library Services Survey to gauge students' opinions on virtual library services and resources in comparison to those in a traditional library. The Distance Library Services Survey provided a foundation for the survey instrument designed for this study. Blackman used the survey to investigate online students' satisfaction of virtual and traditional library services at a southeastern university. Permission to use and modify the Likert-type survey instrument was obtained. The Distance Library Services Survey (Blackman, 2003) includes questions regarding students' use of a physical library; however, those questions were omitted for the purposes of this study. Questions in the survey assessing students' satisfaction with virtual library services and resources, open-ended questions, and portions of the demographic information were included.

Survey Monkey (Finley, 2009) was used to modify, create, and administer the survey instrument for this study. Communication with the study institution's library staff preceded modification of the Distance Library Services Survey to verify all major components of the institution's online library's resources and services were included. The modified Distance Library Services Survey was named the Virtual Patron Library Survey.

Virtual Patron Library Survey. A pilot test of the modified survey instrument was administered to undergraduate and graduate students (N = 55) representative of the respondents in the study population. The pilot test was conducted to identify survey questions of ambiguity, bias, and error. Students were invited to comment on each question in regard to clarity and readability. Students were also invited to comment on the participation incentive. Following a review of the student feedback, changes were made to the survey's construction and questions.

A pilot group of students also completed the survey to allow for testing of the instrument's reliability. Reliability is the ratio of the observed score variance associated with the true score (Groves, 1989). Cronbach's alpha is a technique used to provide a unique estimate of the reliability of a given test (Gliem & Gliem, 2003). Cronbach's alpha reliability coefficient was .92 for the scale. This result is above .70 which is widely considered to be an acceptable reliability level for social science research (Garson, n.d.).

Data Analysis

Following the completion of data collection, the data were exported from Survey Monkey (Finley, 2009) and imported into a software program, Statistical Package for the Social Sciences (SPSS, Version 18), for analysis. Descriptive and inferential statistics were used to illustrate the basic features of the data. In this study, the dependent variable is students' satisfaction and the independent variables are the demographic characteristics.

Results

The data were analyzed using descriptive statistics, independent samples *t* tests, correlation, and analysis of variance assuming equal population variances. Post hoc analyses were conducted on variables with significant results.

The 1,500 students in the sample received an e-mail request to participate generated through the Survey Monkey (Finley, 2009) collector tool. Students who did not respond to the initial message were sent reminders. These efforts resulted in 439 respondents consenting to participate in the Virtual Patron Library Survey for a response rate of 29%. On the Virtual Patron Library Survey several different demographic categories were identified by students: (a) age group, (b) gender, (c) employment status, (d) achieved educational level, (e) major program of study, (f) student status, (g) number of enrolled credits for the term, (h) awareness of the online library, and (i) computer experience.

Age. Traditional college-age students, 17-25 years old, represented the majority (251) of survey participants (59.5%). The 26-40 year age group represented 29.1% of subjects, those aged 41-55 included 10.7% of the subjects and less than 1% was 55 years old or older. The age distribution of the subjects is representative of the student population (UWF, 2009a).

Gender. The gender distribution of the participants was 127 (30.1%) males and 295 (69.9%) females. Survey participant figures indicate a greater percentage of females than males consistent with the general student population of 40% males and 60% females enrolled in the Fall 2009 term for both online and on campus classes (UWF, 2009a).

Employment. There is a nearly even distribution of employment status across the survey participants. One hundred and forty five students (34.4%) reported full time employment, 126 were working part time (29.9%) and 151 identified themselves as not employed (35.8%).

Education. Freshman- and sophomore-level students represented 16.5% of survey participants while the majority (66.2%) was upper division undergraduate students. Master's level students made up 12.6% of the survey participants. Only 7 students were currently in an Education Specialist's program and 13 students were in a Doctor of Education program. Over half (62.1%) of the students were enrolled in 12 or more credit hours. Twenty-three students were taking 3 credit hours or fewer and the remaining 137 students (32.4%) were taking 4 to 11 credit hours.

Awareness of online library. Students answered four questions regarding their awareness of the online library (Table 1). Only 50 (11.4%) of the 437 students who participated in the survey reported they had not accessed the library's home page. When asked if they had seen a link to the online library in any e-learning class, 44.4% (N = 437) of survey respondents reported they had not. Students required to visit the library (online or on campus) to complete an assignment represented 81.9% of participants and 79.9% indicated that an instructor suggested a visit to the library in the syllabus or through an e-mail, discussion, or announcement.

TABLE 1: Awareness of Online Library (n = 437)

Awareness question	*f*		Valid %	
	Yes	No	Yes	No
Have you seen a link to the library on your e-learning site in any course?	243	194	55.6	44.4
Has any instructor suggested that you visit the library (on campus or online) in an announcement, e-mail, discussion or syllabus?	349	88	79.9	20.1
Have you had any assignment that required you to access the library on campus or online?	358	79	81.9	18.1
Have you ever accessed the library home page?	387	50	88.6	11.4

Computer experience and confidence. Since a major element of the TAM (Davis, 1989) is the concept of ease of use, students were asked four questions about their computer experience and

confidence, and then rated their experience with several computer-related tasks (Table 2). Nearly all of the participants (98.8%) own a laptop or desktop computer (N = 425) and 99.8% of the students had taken or were currently enrolled in an online course (N = 425). The number of students who reported owning a handheld Internet-capable device was nearly evenly divided—224 (52.7%) students answered yes and 201 (47.3%) answered no.

TABLE 2: Use of Computers (n = 425)

Question	*f*		Valid %	
	Yes	No	Yes	No
Have you ever taken an online course or are you currently enrolled in an online course?	424	1	99.8	0.2
Do you own a laptop or desktop computer?	420	5	98.8	1.2
Do you own an Internet capable handheld device (e.g., Blackberry or iPhone)?	224	201	52.7	47.3

Computer tasks. Students were asked about their experience with five different computer related tasks: (a) sending an e-mail, (b) posting to a discussion board, (c) participating in a chatroom/social networking site, (d) using the Internet to purchase goods/services, and (e) using the Internet for research/homework. Students used a Likert-type scale with five levels to describe themselves from *extremely experienced* to having had *no experience*. Over 90% of the survey respondents reported they were *very experienced* or *extremely experienced* with sending e-mail, posting to a discussion board, using the Internet to purchase goods/services, and using the Internet for research/ homework. Participants who reported being *extremely experienced* or *very experienced* with social networking represented 77% (Table 3). Items for which students reported no experience were social networking (14), posting to a discussion board (2), and using the Internet to purchase goods/services (1). Values taken from the computer experience questions were aggregated to produce an overall computer experience group variable with a mean of 4.64 and a standard deviation of .510, (N = 425) indicating students were very experienced with computer-related tasks.

TABLE 3: Frequencies and Percentages of Students' Experience with Computer-Related Tasks (n = 425)

Task	Extremely to very experienced		Moderate to little experience		No experience	
	f	%	*f*	%	*f*	%
Sending an e-mail	417	98.1	8	0.01	0	0.0
Posting to a discussion board	400	94.0	22	5.1	2	0.4
Participating in a chatroom/social networking site	329	77.0	82	19.0	14	3.2
Using the Internet to purchase goods/services	388	91.2	36	8.4	1	0.2
Using the Internet for research/homework	409	96.2	16	2.0	0	0.0

Results of students' computer-related experience are reported using means and standard deviations (Table 4). The highest mean of 4.86 was reported for sending an e-mail indicating students were very experienced with the use of e-mail messaging.

TABLE 4: *Mean and Standard Deviation of Students' Experience with Computer-Related Tasks (n = 425)*

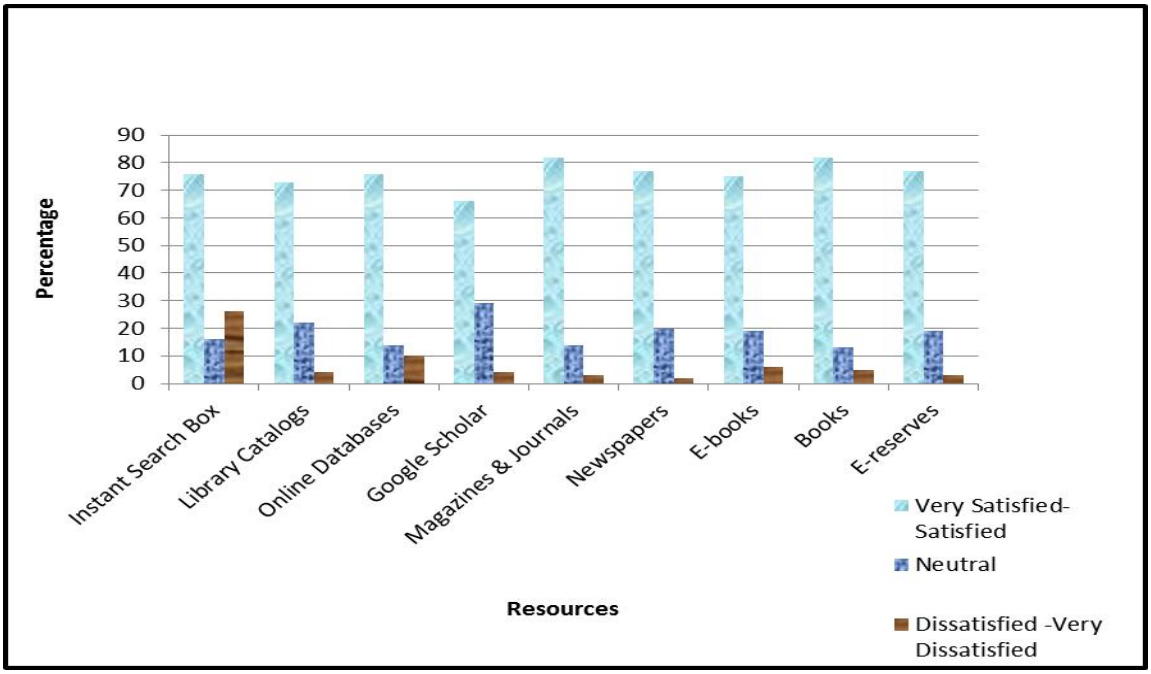
Task	*M*	*SD*
Sending an e-mail	4.86	0.399
Posting to a discussion board	4.69	0.631
Participating in a chatroom/social networking site	4.29	1.103
Using the Internet to purchase goods/services	4.64	0.710
Using the Internet for research/homework	4.74	0.516

Computer confidence. Survey participants were asked about confidence in their ability to use a computer. Five answer options ranged from *very confident* to *very unconfident* on a Likert-type scale. Overall, 96% of students (*N* = 425) were *confident* to *very confident* in their ability to use a computer. The mean was 4.64 and the standard deviation was .595.

A summary of the data collected and results determined are provided in the order of the research questions. Results of the descriptive statistics and significant inferential analyses are illustrated in table and narrative format.

Research Question 1. The first research question addressed in this study was, "How do online library resources satisfy virtual patrons?" Results indicate students were generally *neutral* to *very satisfied* with the university's online library resources (Figure 1). Five answer options on a Likert-type scale ranged from *very satisfied* to *very dissatisfied*.

FIGURE 1: Percentage of satisfaction with online library resources.

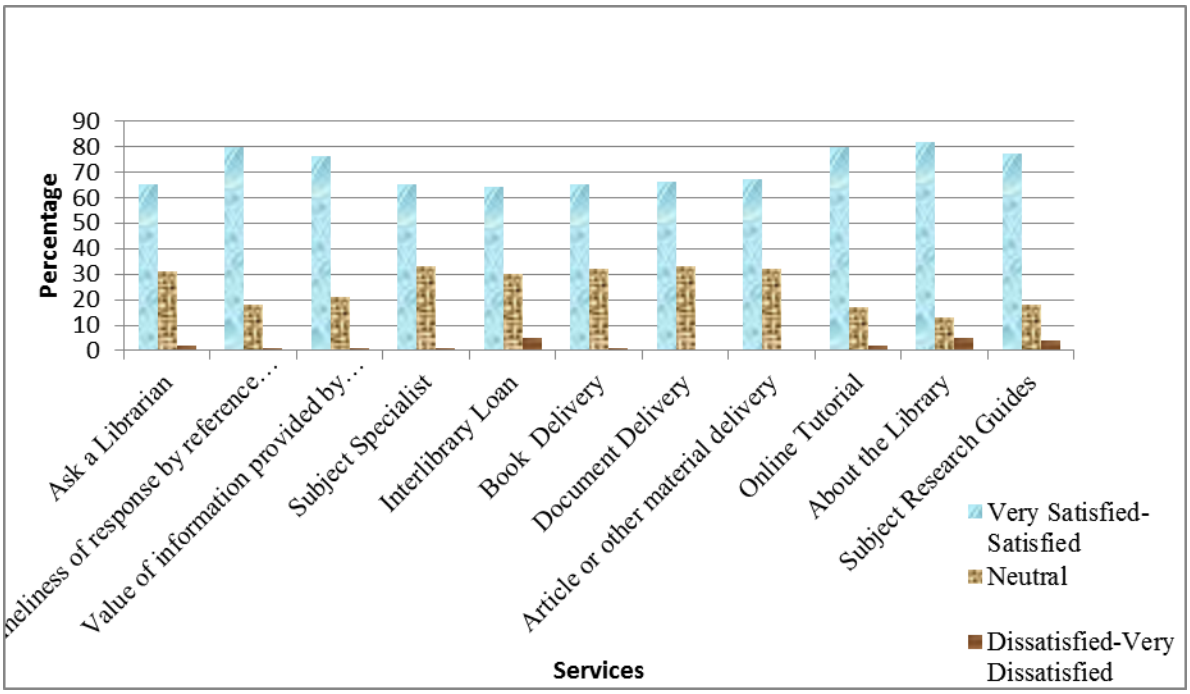


Mean satisfaction for the various resources ranged from 3.67 to 4.14 indicating students were satisfied with the library's online resources. All online library resources shown in the survey instrument were collapsed to create one resources group for further data analysis. The mean and standard deviation of the collapsed resources group was $M = 3.87$, $SD = .567$, ($n = 185$) indicating students were satisfied with the library's online resources.

Research Question 2. The second research question addressed in this study was, "How do online library services satisfy virtual patrons?" Results indicate that students were *neutral* to *very*

satisfied with the university's online library services (Figure 2). Frequencies and percentages are provided as an overview of students' satisfaction.

FIGURE 2: Percentage of satisfaction with online library services



Students' mean satisfaction with the online library services ranged from 3.86 to 4.19 indicating they were satisfied. All online library services were collapsed to create one online library services group resulting in a mean of 3.88 and standard deviation of .605 (n = 105) again indicating that students were satisfied.

Results of students' mean satisfaction with the library's online services indicated students were generally satisfied. Students' satisfaction is reported with individual online library services and through data analyzed in the collapsed online library services group.

Research Question 3. Students' demographic characteristics were analyzed to determine if any contributed to satisfaction with the university's online library resources. Tests of analysis of variance (ANOVA) were conducted with the following demographic factors: (a) age group, (b) gender, (c) employment status, (d) achieved educational level, (e) student status, (f) number of

credit hours enrolled, and (g) field of study. Correlation analyses were conducted with the computer experience variable.

Age group. Student age groups were aggregated into three categories for data analyses: (a) 17 to 25, (b) 26 to 40, and (c) 41 and older. An ANOVA was conducted to determine if age influenced virtual patron satisfaction with the online library resources. A significant difference was indicated, $F(2, 176) = 3.604$, $p < .05$. A post hoc test of least significant differences was conducted to determine that students in the 17 to 25 age group were significantly ($p < .05$) more satisfied with the online library resources followed by students in the 26 to 40 and 41 and older groups.

Gender. An independent samples *t* test was conducted to determine if gender influenced virtual patrons' satisfaction with the library's online resources. Results indicate females are significantly more satisfied with the online library resources than males, $t(177) = -2.766$, $p < .05$ (Table 5).

TABLE 5: Gender and Satisfaction with Online Library Resources

Gender	*n*	*M*	*SD*
Male	56	3.70	.594
Female	123	3.95	.542

Note. The smaller total respondents figure reflects the number of online resources students had not used.

Employment status. An ANOVA was conducted to determine if students' employment status influenced satisfaction with the library's online services. There was no significant difference.

Student status. No significant differences were related to students' academic status and the library's online resources**.** However, once the student status categories were collapsed into two groups (undergraduate and graduate) significant differences were indicated following an independent samples *t* test. Undergraduate students are significantly more satisfied than graduate students with the online library resources, $t(175) = 2.046$, $p = .042$.

Number of enrolled credit hours. Students indicated enrollment in credit hours from (a) 0-3, (b) 4-6, (c) 7-11, or (d) 12 or more. No significant differences in enrolled credit hours and satisfaction with the library's online resources were found.

Field of study. In the Virtual Patron Library Survey 422 students indicated their major program of study from a drop down list of 58 choices. The largest *N* for any one program of study was only 36; therefore, majors were collapsed into three broad categories of study. Field of study data were grouped by (a) arts and sciences, (b) business, and (c) professional studies to provide meaningful data for analysis. Categories were established consistent with the university's colleges. No significant differences for field of study were found.

Computer experience. Items in the computer experience questions were interval data and collapsed into a computer experience group for analysis. A Pearson's *r* was conducted to determine if any correlation existed between students' computer experience and satisfaction with the library's online resources. Results indicate a significant correlation between students' computer experience and satisfaction with online library resources: $r(180) = .252$, $p < .01$ (Table 6).

TABLE 6: Correlation of Computer Experience and Satisfaction with Online Library Resources

Group		Resources	Computer experience
Resources	Pearson *r*	1	.252
	Sig. (2-tailed)		$p < .05$
	N	185	180
Computer experience	Pearson *r*	.252	1
	Sig. (2-tailed)	$p < .05$	
	n	180	425

Note. Correlation is significant at the .05 level (2-tailed).

Regression analysis indicates 6.3% of the variance in satisfaction with the online library resources is accounted for by students' computer experience. Results indicate a significant correlation between satisfaction with the library's online resources and student's computer experience (Table 7).

TABLE 7: *Regression Analysis of Computer Experience Group and Online Resources Group*

Mode	*r*	r^2	Adjusted r^2	SE of the estimate	Change Statistics			
					r^2 change	*F* change	*df1*	*df2*
1	.252	.063	.058	.55117	.063	12.029	1	178

Analysis of variance, independent samples *t* tests, and correlation and regression analyses were conducted to determine if any demographic factors influenced students' satisfaction with the library's online resources. Results indicate age, gender, student status, and computer experience influenced students' satisfaction with the library's online resources.

Research Question 4. To determine which demographic factors influenced virtual patrons' satisfaction with the library's online services, additional analyses of variance were conducted on the collapsed services subscale. No significant differences were found for age group, gender, employment status, student status, number of enrolled credit hours, or field of study.

Students' satisfaction with the library's online services is significantly correlated with their computer experience. Results of a Pearson's correlation test, $r(102) = .269$, $p < .01$ illustrate the significance with the computer experience group and the services subscale (Table 8). Results indicate students with more reported computer experience are also more satisfied with the library's online services.

TABLE 8: Correlation of Computer Experience and Satisfaction with Online Library Services

Group		**Computer experience**	**Services**
Computer experience	Pearson *r*	1	.269
	Sig. (2-tailed)		$p < .05$
	N	425	102
Services	Pearson *r*	.269	1
	Sig. (2-tailed)	$p < .05$	
	N	102	105

Note. Correlation is significant at the .05 level (2-tailed).

Variance in satisfaction with online library services for computer experience is 7.2% (Table 9). Results indicate a correlation in satisfaction with the online library services and students' computer experience.

TABLE 9: Regression Analysis of Computer Experience Group and Online Services Group

					Change statistics			
Mode	***r***	***r*²**	**Adjusted *r*²**	**SE of the estimate**	***r*² change**	***F* change**	***df1***	***df2***
1	.269	.072	.063	.57325	.072	7.790	1	100

Analyses of variance, independent samples *t* tests, and correlation and regression analyses were conducted to determine if any demographic factors influenced students' satisfaction with the library's online services. Results indicate no significance for age group, gender, employment status, educational level, student status, number of enrolled credit hours, or field of study. Significant results were found for students' computer experience.

Additional Data

Several additional questions were addressed in the survey to provide an overall picture of students' satisfaction with the services and resources available through the university's online library. Two of these questions were multiple choice and two were open-ended questions. The results of these questions are provided.

Overall adequacy and equivalency. Students were asked two questions regarding the overall adequacy of the online library and its equivalency to the campus library. Descriptive statistics were used to calculate the results (Table 10). The majority (88.3%) of students' needs are met by the online library's resources and services. Sixty-four percent of the participants feel the university's online library resources and services are equivalent to those available on campus. Nearly one fifth (17.5%) of the survey participants had never visited the campus library.

TABLE 10: Overall Adequacy and Equivalency of Online library Resources and Services

Question	*f*			Valid %		
	Yes	No	Never visited campus library	Yes	No	Never visited campus library
Overall, do you feel that the online library resources and services are adequate to support your needs?	378	50	-	88.3	11.7	-
Overall, do you feel the online library resources and services are equivalent to those available on campus?	274	79	75	64.0	18.5	17.5
Removing data from students who had not visited the campus library	274	79	-	77.0	22.0	-

Analysis of narrative responses. Slightly more than half (218) of the students who took the survey responded to the optional open-ended question, "How may the library better serve online learners?" Three major themes emerged following analysis of students' comments: (a) ease of use, (b) access to materials, and (c) awareness of the online library. Representative student comments regarding ease of use centered around navigability of the library's website, using the online databases, and search engines. Verbatim comments regarding ease of use included:

- Sometimes I have trouble selecting search options because I don't understand what kind of information should be entered.
- Some of the sources can be confusing. For example, when recently trying to use an online database, I had trouble and could not figure out how to open and view the actual article I was attempting to use.
- Create a more friendly website that is easier to navigate.

Second in frequency were student comments about access to online materials. Comments were made regarding the need for more databases and access to course specific journals. Verbatim comments included:

- The only problem I ever have is trying to find scholarly nursing peer reviewed articles pertaining to what I need.
- More online books would always be great.
- Have a wider variety of books and research papers online.

And finally, students commented about the need for more advertising about the library. Comments regarding library awareness included:

- Better advirtise [*sic*] services, I don't know of anything the library does.
- Increased awareness of online resources.
- Promote and market this info. Would be use [*sic*] if people knew about it.

In response to the second optional narrative question, "What additional library resources/services should be available online?" 172 students offered their ideas.
The majority of students' comments were requests for more access to e-books and journals. For example,

- More recent articles from major magazines or journals.
- Maybe more e-books since the physical library is not open 24/7.
- More online journals and newspapers.

Overall student comments reflected the need to have a more user friendly online library website and the ability to find needed articles and journals. Students also want a greater variety of e-books to eliminate going to the physical library for research. Many students were also not aware of the resources and services offered by the online library.

Discussion

The concept of the university library has evolved in conjunction with the development of technology and mobile methods of communication. Accordingly, student use of the academic library continues to be dynamic (DeRosa et al., 2006; Kolowich, 2009; Kuh & Gonyea, 2003). The academic library may be a place to meet, a toolbar, a set of online services or a link in a learning management system (Dempsey, 2009). The findings from this survey of virtual patrons'

satisfaction with a university's online library reflect the need for ongoing dialogue with online learners.

Research Question 1: How do Online Library Resources Satisfy Virtual Patrons?

Students' general satisfaction with the resources found online at the university library is consistent with Blackman's (2003) findings from a survey of students in Regents Online Degree Programs. Similarly, in a report to the Online Computer Library Center, DeRosa et al. (2006) found 72% of college students agreed that the library's collection and content met their needs. Most students had used the library catalogs, online databases, books and the instant search box located on the library's home page. Use and familiarity with a digital library results in satisfaction if students are able to successfully navigate their way to needed resources (Koohang, 2004). The findings of this study provide additional evidence that ease of use and usefulness are indicators of satisfaction with an information system. However, given the frequency of resources students had not yet accessed reveals improvements to navigability may be indicated.

Research Question 2: How do Online Library Services Satisfy Virtual Patrons?

The results of overall satisfaction with the library's online services agree with Blackman's (2003) and Brandt's (2008) survey findings and are also consistent with DeRosa et al.'s (2006) report to the Online Computer Library Center. Blackman's results indicated participants were *neutral* to *satisfied* with the services available through their distance library. Brandt reported 80% of students were *satisfied* or *extremely satisfied* (17.3%) with the university libraries' quality of service. In DeRosa et al.'s report, 75% of college students *agreed* or *completely agreed* that their library's services met their needs.

Students' use and satisfaction (56% were *satisfied* to *very satisfied*) with the online tutorials indicate a need for simplicity for navigation to the library's online services. DeRosa et al.'s (2006) findings are consistent in that students cited ease of use and convenience as reasons for choosing a searching tool to find information. An interesting finding is that while nearly all of the students surveyed were enrolled in an online course, only 26% had used the Ask a Librarian chat service available online. One reason for this may be that the chat service is only available Monday through Friday from 8:00 am-4:00 pm.

The majority of students had viewed the About the Library services link which provides information about hours, online tutorials, and subject specialist contacts; however, less than 38% of students had ever used the subject specialist service. Fewer than half had used the interlibrary loan service indicating a need for making students aware of this service. Additionally, use of similar delivery services—book, document and article delivery—were also reported by fewer than half of the survey participants. Students' lack of awareness of services is consistent with students' narrative responses regarding ways the library may better serve online learners. Many students' comments revealed they were not aware of the online library services listed on the survey. Lack of awareness of online library services is consistent with DeRosa et al.'s (2006) findings which indicated students did not use the online library because they did not know the website existed. Findings from this study are also consistent with Nicholas and Tomeo's (2005) study of library websites which indicated that simply providing online resources and services is insufficient. Making students aware of the services which are available and providing instruction on the use of those services is also necessary.

Research Question 3: How do Demographic Factors Influence Virtual Patron Satisfaction with the Resources provided by the Online Library?

Students in the 17-25 age category were found to be significantly more satisfied with the online library resources than their peers in other age groups. This finding is in contrast to Blackman (2003) who compared age and satisfaction with distance library resources. Blackman found no significant difference for age groups when investigating satisfaction with online library resources. The current study's findings also contrast to Koohang (2004) who explored perceptions toward the use of the digital library. Koohang found no significant difference for age. Results from this study are also consistent with the research on attitudes towards using the Internet. Porter and Donthu (2006) found younger ages correlated positively with perceived ease of use and usefulness. However, applying the TAM, users who are adopters of technology and find information systems easy to use and useful also find acceptance or satisfaction with technology.

Female survey participants were significantly more satisfied than their male counterparts with the library's online resources. This finding is in contrast to Blackman (2003) who found no significance for gender and satisfaction with online library resources, but is consistent with the findings of Koohang (2004). Koohang found a significant difference in gender; however, his results indicate males scored higher on their perceptions toward use of the digital library. Females represented nearly 70% of those who participated in the Virtual Patron Library Survey which may have contributed to the gender difference.

Analysis of variance with the seven categories of student status and satisfaction with the library's online resources revealed no significant differences. However, following the collapse of student status categories into two groups—undergraduate and graduate—results of an independent samples *t* test indicated undergraduate students were significantly more satisfied than graduate students with the online library resources. This finding is in alignment with Blackman (2003) who found freshman were significantly more satisfied with the distance library than students in other academic status groups.

Students' reported computer experience with several computer-related tasks correlated positively with their satisfaction with the library's online resources. This finding is consistent with other studies related to computer experience and the use of digital information systems (Koohang, 2004; Koohang & Ondracek, 2005; Park et al., 2009; Sahin & Shelley, 2008). Conversely, the results are in contrast to Blackman (2003) who found no significant difference for computer experience and student satisfaction with a digital library.

Demographic factors influenced virtual patrons' satisfaction with the library's online resources. The youngest age group (17-25), females, students who had completed up to and including a Bachelor's degree, and undergraduate students all were found to be significantly more satisfied than other demographic groups with the library's online resources. Students who rated themselves as more experienced with computer-related tasks were also found to be significantly more satisfied with the library's online resources than those with limited experience.

Findings indicate students older than 25, males, and students in graduate programs may be less aware of the library's online resources. These same students may also face challenges with navigability of the library's website as indicated by student's narrative comments. Consistent with the TAM, students who reported more computer experience also found more satisfaction with the library's online resources indicating ease of use and usability of the system result in greater satisfaction.

Research Question 4: How do Demographic Factors Influence Virtual Patron Satisfaction with the Services provided by the Online library?

The lack of significant results for age, gender, employment status, field of study, student status, and number of enrolled credit hours could be a factor of the low number of collective responses in the collapsed services group (n = 105). The small n is a reflection of the larger numbers of *haven't used* items students reported from among the 11 online library services. Students may not have used these services because they were not aware of their availability as an online library service. However, the overall mean of 3.88 for the services group reflects student satisfaction for the items they have used.

A positive correlation for computer experience and student satisfaction is consistent with Park et al.'s (2009) research on perceived ease of use as a predictor of usage of a digital library system and with Davis' (1989) TAM. The positive correlation is also consistent with other research related to computer experience and the use of digital information systems (Koohang, 2004; Koohang & Ondracek, 2005; Sahin & Shelley, 2008).

Narrative comments submitted by survey participants identify areas for further research. The two open-ended questions were (a) How may the library better serve online learners? and (b) Which additional library resources/services should be available online?

Ease of Use

While Online Tutorials were rated with a mean of 4.10 by survey respondents, many of their narrative comments on ways to improve the online library reflected the need for improvements to searching databases and finding articles. Similarly, following a survey of college students' use

of libraries, DeRosa et al. (2006) reported students had difficulty finding articles and also had issues with ease of use. Majors themes which emerged from analysis of the question which asked students how the online library could better serve online learners were (a) the need for more user friendly search options, (b) greater access to online materials, and (c) increased awareness of the online library's resources. Typical (verbatim) comments were:

- A better search tool when doing research. I have done research in the past and the search tool isn't very helpful.
- Sometimes I have trouble selecting search options because I don't understand what kind of information should be entered.
- Mainly just easier ways to get to full text articles.
- By making the instructions on how to use the campus library and the online library clearer, more students would feel comfortable using the library for research. Tutorials can be confusing, and very few teachers use class time to explain how to do research in the library.
- Create a more user friendly website that is easier to navigate.

Students' comments and the numbers of online items students had not used suggest consistency with the TAM (Davis, 1989). The need for easy navigability (ease of use) and successful searching (usefulness) is a reflection of satisfaction based on the TAM. Students may have been unable to utilize online resources and services because of difficulty using the website.

Finally, when students were asked about which additional resources and services the library should make available online, the two major items were the need for more journals and e-books. Online learners expect the library to provide resources which match the breadth of Google Scholar with the ease of an Internet search engine. The request for more e-books is consistent with the increasing popularity of e-readers.

Implications

Significant findings and themes from students' narrative responses have direct implications for several stakeholders: students, faculty, administrators, and librarians. Each group may benefit from the findings presented.

Students. Several findings have direct implications for students' satisfaction with virtual libraries. Females were more satisfied than males with the online library resources. Findings from previous research and this study suggest students should seek out the resources provided by the online library. Also, those students with limited computer experience should participate in library-skills training available online. Online learning students should also participate in training to increase skills in the use of computer applications and online library resources.

Faculty. Professors should regularly provide links and instructions to assist students in locating course relevant materials. In an essay on the role of librarians, Benton (2009) writes, "I have passed whole semesters without setting foot in the library, even as I urge and require my students to do so" (p. 3). In addition, Kuh and Gonyea (2003) write, "if institutions are serious about graduating information literate students they should require activities that give students practice and require them to demonstrate their competence in evaluating the quality of the information they use" (p. 268). Digital information literacy should not be assumed because a generation has grown up using the Internet and other technology. Comments from the current study corroborate this opinion.

Administrators. The administrators of institutional online libraries may benefit from considering the experience of the virtual patrons who participated in this study. The results of information gathered may help guide decisions on the purchasing of online resources, marketing the online library and the navigability of a library's website. Library administrators should consider innovative methods of linking virtual patrons to the library's online resources—from chat sessions to downloadable maps. Within the realm of adding more resources, however, administrators must also consider the skills needed to allow online users to find and use those materials.

In addition, stakeholders of the university library should regularly solicit student opinion on the ease of use and usefulness of the online library's resources and services. For example, at the study university the last LibQual survey—a comprehensive study designed to measure the quality of library services from students and staff—was conducted in 2004. With the continued rapid changes in communication and technology, a gap of more than 2 years in surveying students allows for a disconnect in administrators' knowledge of student satisfaction.

Determining student satisfaction is one of the five pillars of quality—Learning Effectiveness, Scale, Access, Faculty Satisfaction, Student Satisfaction—in distance education as outlined by the Sloan Consortium (Moore, 2008).

Librarians. It may be helpful to online learners to have library-related resources linked to e-learning courses. Embedded librarian programs provide student-focused services and a presence within the online learning environment which enhance student learning (Adolphus, 2009; Chesnut, Henderson, Schlipp & Zai, 2009). Student comments and the numbers of items students had not used reflect the need for this service.

Virtual patrons will also benefit from online libraries which provide real-time services to students working on research assignments outside of normal business hours. It is also necessary to provide those services to students via the technology which students are using. At some universities librarians are now answering reference questions with text messages (Miller, 2010).

Meeting the needs of those virtual patrons by providing easy to use and useful resources and services provides for a successful academic experience. It is imperative that library administrators understand the needs of their virtual patrons by consistently reaching out using a variety of current communication methods. Connecting users with resources seamlessly permits for a successful virtual library experience. In turn, student satisfaction is facilitated by a support service which meets expectations.

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