Received 29 January 2015
Revised 16 March 2015
Accepted 5 April 2015

Factors affecting undergraduates' selection of online library resources in academic tasks

Usefulness, ease-of-use, resource quality, and individual differences

Soohyung Joo and Namjoo Choi
School of Library and Information Science, University of Kentucky, Lexington, Kentucky, USA

Abstract

Purpose – The purpose of this paper is to explore multiple factors affecting online library resource selection by undergraduate students. Three dimensions of factors are investigated including usefulness and ease-of-use, resource quality, and individual differences.

Design/methodology/approach – An instrument was developed to measure various aspect factors and online library resource use intention. A survey was administered to 332 undergraduate students. Quantitative analysis, including structural equation modeling, ANOVA, and *t*-tests, was used to statistically examine the effects of the identified 11 factors on the use intention of online library resources.

Findings – The findings indicated that both usefulness and ease-of-use positively influenced the undergraduates' use intention of online library resources. Also, five resource quality constructs – accessibility, credibility, coverage, currency, and format – were the determinants of online library resources use intention. Interestingly, the effect of accessibility was the strongest, while that of credibility was the weakest. In addition, this study found that familiarity with sources and use of good search skills had a significant effect on users' use intention at the individual user level.

Originality/value – This study is one of the few studies investigating multiple factors comprehensively that influence online library resource selection.

Keywords User studies, Library users, Electronic resources, Academic libraries

Paper type Research Paper

Introduction

Undergraduate students represent a new generation of users called the "digital natives." They are individuals who have grown up with access to computers their whole lives, and therefore are very comfortable using information from online sources (Connaway *et al.*, 2008; Zimerman, 2012). Accordingly, modern-day undergraduates prefer and use online sources more than traditional printed materials (Lee *et al.*, 2012). Among different online resources, undergraduate students prefer to use easily accessible web sources via search engines rather than library sources (e.g. Kim and Sin, 2011; Haglund and Olsson, 2008; Selwyn, 2008). However, those easily accessible web sources are not necessarily credible and reliable. Previous studies claimed that resources provided by academic libraries are more credible and accurate than easily accessible web information (Rieh and Hilligoss, 2007; Lee *et al.*, 2012). Although undergraduate students perceive online library resources to be more reliable, they still prefer to use search engines to quickly find information needed for completing their classwork (Connaway *et al.*, 2011).

Library Hi Tech
Vol. 33 No. 2, 2015
pp. 272-291

0737-8831
DOI 10.1108/LHT-01-2015-0008

The heavy reliance on web search engines and easy-to-access sources for undergraduates can be problematic in an academic setting, where class assignments and research require a variety of credible and accurate sources. To encourage college students to use more reliable library resources, it is imperative to understand the underlying reasons of their selection of online library resources. Understanding of the factors associated to the selection of online library resources is critical to come up with strategies to increase the library resource use by undergraduate students, who are a significant segment of user groups in academic libraries. In this study, online library resources refer to library collections and materials provided in a digital format accessible remotely through the web, such as e-books, electronic journal articles, online magazines, dissertations and theses, course reserves, and digital archives. Traditional library resources, which are characterized by printed materials such as books and printed journals, are quickly giving way to digitization tools and online technologies.

This paper presents a comprehensive investigation of multiple factors that influence the selection of online library resources by undergraduate students. To be more specific, the authors undertook an empirical study to examine if the use intention of online library resources could be explained by three groups of variables pertaining to usefulness and ease-of-use, resource quality, and individual differences. The unique contribution of this study lies in that it incorporates three dimensions of factors simultaneously to understand reasons underlying undergraduates' online library resources usage. Based on the findings, the authors also discuss practical suggestions to encourage undergraduates to use library resources in their academic tasks.

Literature review

The way undergraduate students select information resources has changed dramatically in the last few decades. Current undergraduate students, also called millennial students or digital natives, have used the internet from an early age and are more technologically savvy than previous generations (Zimerman, 2012). The internet has changed resource selection behaviors of those undergraduate students; predominantly, they rely on the web, in particular search engines like Google, to find their information. Students prefer using web search engines to libraries because of their convenience, speed, and reliability, although they perceive library resources to be accurate and credible (Holman, 2011). Many previous studies addressed the fact that convenience and ease-of-use are considered the key factors in undergraduates' resource selection. In Haglund and Olsson's (2008) study, undergraduate students themselves identified as "lazy" and prioritized convenience in their information selection decisions. The preference of convenience and ease-of-use in selecting information led undergraduate students to rely on internet sources searchable by popular web search engines. According to Lee (2008), the web was the most popular go-to source for information among college students, while academic library resources came in second.

In particular, undergraduates, as the name "Google generation" implies, heavily rely on Google. Connaway *et al.* (2011) claimed that not only was Google a popular search tool among students, but they often thought of the web and Google interchangeably. According to Griffiths and Brophy's (2005) survey, approximately 45 percent of students used Google for their initial searches, while about 55 percent never used library bibliographic databases. Connaway *et al.* (2011) affirmed that convenience was

a significant factor in resource selection of undergraduates in class-driven search tasks. They found that the primary reasons why college students liked Google were ease-of-use and almost immediate search result delivery for their search queries. College students were also likely to initially use Google for their search tasks due to accessibility, familiarity, and acceptance of natural language (Currie *et al.*, 2010; Head and Eisenberg, 2010).

As undergraduates are used to convenient and easy-to-access sources, they would rather avoid resources that require complex steps to access information when performing searches (Malliari *et al.*, 2011). Denison and Montgomery (2012) found that college students perceived online databases to be complex and inefficient, but not intuitive or less user friendly. The law of least effort applies to undergraduates' resource selection behavior. Lee (2008) pointed out that students had a tendency to take the path of least resistance when performing academic searches. She also addressed that students were likely to search for information at the last minute, and accordingly they had to use instantly available online resources that were directly accessible to them. Badke (2013) found that students liked to seek out the easy path when it came to research projects as they were not willing to spend much time on them. Even in class search tasks, undergraduates preferred to use web search engines and internet sources. For example, Martin (2008) found that 72 percent of the student respondents chose the internet for class-related research, although they recognized that library resources would be more reliable.

One of the concerns with the undergraduate student's preference for easily accessible web information is whether students can obtain reliable information from available sources. Researchers investigated the perception of undergraduates regarding resource credibility and the effect of credibility on their resource selection. According to Kim and Sin's (2011) study, students considered accuracy one of the most important factors in evaluating sources and perceived library sources as accurate information. However, their findings indicated that students did not necessarily choose those accurate library sources in practice because the web was perceived as easier to use. Metzger *et al.* (2003) found that undergraduates were less likely to validate the credibility of web information although they frequently used the internet for their class-related tasks. Twait's (2005) study also indicated that students assessed the content of the source, but also at the same time, emphasized familiarity and availability when selecting information sources. Lim (2009) addressed that students were aware that Wikipedia may include inaccurate information. However, despite their cautiousness, students did not make any special effort to verify the accuracy of the information from Wikipedia.

Some researchers have contradicted these studies, however. For example, Biddix *et al.* (2011) claimed that students were more likely to reference academic library resources over web sources when it comes to research papers and projects. This implies that the quality of the information was considered a higher priority than the convenience factor by undergraduates when they conducting formal research assignments. Rieh and Hilligoss (2007) conducted interviews with 24 college students to survey their perception of credibility regarding digital media. They found that students were aware of the reliability issue in web source usage and tried to apply several different search strategies to cope with it.

Overall, previous literature uncovered that undergraduates place more weight on convenience, ease-of-use, exerting the least amount of effort, and familiarity when it comes to resource selection. Despite knowing the importance of resource credibility,

students still prefer to use easily accessible web sources, and are less likely to seek credible sources from the library. However, some researchers argued that undergraduate students tend to use library sources for formal research, and are aware of the reliability issue in using digital information.

As discussed in the literature review, researchers have greatly contributed to the understanding of the unique resource selection behavior of undergraduate students. Despite all these efforts, less research has specifically focussed on online library resource usage of college students in academic search tasks. Prior studies explicitly showed that the millennial generation prefers easy-to-use, convenient, and easily accessible web resources to library resources. However, there were fewer studies that examined multiple factors holistically and quantitatively in the context of online library resources focussing on undergraduate students. This limitation illustrates the need for a comprehensive investigation of multiple factors, including ease-of-use, usefulness, resource quality, and individual differences.

Research questions

To comprehensively understand multiple factors affecting undergraduates' selection of online library resources, three-specific research questions were established as follows:

RQ1. Do the usefulness and ease-of-use of online library resources influence undergraduates' use intention?

RQ2. Does the quality of online library resources influence undergraduates' use intention?

RQ3. How do user differences influence undergraduates' use intention of online library resources

Methodology

Data collection

To measure the constructs and variables identified in the study (see Research design section), a survey was administered to randomly selected undergraduate students in a state university in the USA. The survey questionnaire consisted of: demographic information; use frequency and familiarity; information search skills; perceptions of ease-of-use, usefulness, and resource quality; and attitude and use intention in relation to online library resources. To ensure the participants' understanding of the concept of online library resources, the definition of online library resources was presented to the participants at the beginning of the survey. Since the study investigated user experience of online library resources, only the respondents who had used them before were allowed to participate in the survey. All questions regarding user perception were measured based on the seven-point Likert scale. The survey was conducted between September 15 and September 29 in 2015 for around two weeks, and in total, 332 valid responses were collected from the undergraduate population in the selected university. Table I presents the demographic information of the participants.

Research design

This research includes three aspects of factors affecting online library resource selection of undergraduates. Those three dimensions of factors are: usefulness and ease-of-use; resource quality; and individual user differences.

Item	Category	Frequency	%
Gender	Male	123	37.0
	Female	209	63.0
Age	18-22	286	86.14
	23-27	21	6.3
	28 or older	16	4.8
	No response	9	2.7
Status	Freshman	105	31.6
	Sophomore	66	19.9
	Junior	73	22.0
	Senior	88	26.5
Use frequency	Daily	7	2.1
	2-3 times a week	30	9.0
	Once a week	31	9.3
	2-3 times a month	75	22.6
	Once a month	68	20.5
	Less than once a month	121	36.4
Familiarity with online library resources	Extremely familiar	10	3.0
	Very familiar	48	14.5
	Moderately familiar	141	42.5
	Slightly familiar	113	34.0
	Not at all familiar	20	6.0

Table I.
Demographic information

First, to answer *RQ1*, the technology acceptance model (TAM) was employed, which examines the impact of usefulness and ease-of-use. TAM was originally proposed to examine the effect of usefulness and ease-of-use to explain user technology adoption behavior (Davis, 1989), and it has had wide applications in various contexts. TAM assumes that usefulness and ease-of-use are the key determinants of technology selection, and user attitude is placed between usefulness and ease-of-use and use intention. On the basis of TAM, the research model for *RQ1* was designed. It hypothesizes that usefulness and ease-of-use would affect users' selection of online library resources.

Second, the study investigated the effects of resource quality on online library resource use intention (*RQ2*). Since users tend to find quality information to solve their search problems, the authors assumed that improved resource quality would lead to increased user intention to select online library resources. Resource quality is a multifaceted concept that consists of multiple constructs, such as credibility, currency, and accessibility (Stvilia *et al.*, 2009). DeLone and McLean (1992) also identified multiple subordinate constructs, such as accuracy, completeness, and format, to explain information quality in the context of information system use. This study posits five constructs to represent the resource quality of online library resources. Those five constructs are: accessibility; credibility; coverage; currency; and format. Lee *et al.* (2012) chose these five constructs from among the key factors affecting resource selection.

Third, individual user differences were of interest in this study. As to *RQ3*, the study investigated how individual differences, such as gender, familiarity, and information search skill, would be associated with the use intention of online library resources. Table II shows the variables used in the study and their operational definitions.

Category	Research question	Variable	Operational definition
Independent variables	*RQ1*	Usefulness[a]	The degree to which a user perceives that using online library resources would enhance his/her job performance
		Ease-of-use[a]	The degree to which a user perceives that using online library resources would be free of effort
	RQ2	Accessibility[a]	The degree to which a user perceives online library resources would be accessible for his/her task
		Credibility[a]	The degree to which a user perceives online library resources would be accurate and reliable for his/her task
		Coverage[a]	The degree to which a user perceives online library resources would cover a wide range of topics or time scope
		Currency[a]	The degree to which a user perceives online library resources would cover recently updated information
		Format[a]	The degree to which a user perceives online library resources would provide a well-organized format of information materials
	RQ3	Gender	Male or female
		Familiarity with online library resources	To what extent a user perceives his/her familiarity with online library resources
		Library instruction program experience	Prior experience in a library instruction program
		Information search skill	Self-claimed level of online information search skill
Intervening variable	*RQ1*	Attitude[a]	The degree to which a user positively thinks about using online library resources
Dependent variable	*RQ1*, *RQ2*, and *RQ3*	Intention to use online library resources[a]	The degree to which a user intends to use online library resources to achieve his/her academic task

Note: [a]Latent variable measured by multiple observed items

Table II. Research variables and corresponding operational definitions

Measurement instrument and data analysis

The study measures user perceptions of different constructs. Multiple items were identified to measure latent variables listed in Table II. In measurement theory, it has been recommended that multiple items be used to ensure reliability. In general, a subjective construct tends to be multifaceted in nature, so single item measurement may result in lower reliability (Nunnally and Bernstein, 1994; DeVellis, 2003). Thus, in this study, three or four measurement items were generated for each latent construct to achieve better measurement reliability. Content validity refers to the extent to which the items comprehensively and correctly represent the identified construct (Carrier *et al.*, 1990). In order to ensure the content validity of an instrument, the authors referred to previous studies that suggested items or provided definitions related to the constructs that this study attempted to measure. Extracting measurement items from relevant research is one of the most widely used techniques to assure content validity (Joo and Lee, 2011). The authors reviewed a number of relevant studies pertaining to TAM and resource quality in the fields of library science and management information

systems (see the references column of Table III). From the previous literature review, a range of relevant measurement items were extracted. The extracted items were modified to reflect the unique context of online library resources. The wording of those items were reviewed and modified by two experts who have years of research experience in the discipline of information systems. Table III presents the measurement items used in the survey.

To answer the research questions, the collected data were analyzed quantitatively using inferential statistics, including structural equation modeling, multiple regression, *t*-tests, ANOVAs, and linear regression. For *RQ1*, structural equation modeling was employed to empirically test the identified research design involving effectiveness and ease-of-use (see Figure 1). A covariance matrix from the observations was acquired for the TAM-based model, and then structural equation modeling was carried out using the maximum likelihood method. For *RQ2*, severe correlations between independent variables were observed, so factor scores were used to represent the constructs to avoid the collinearity problem. Then, a multiple regression was conducted. For *RQ3*, *t*-tests, ANOVA, and linear regression were employed.

Cronbach's α coefficients were calculated to examine the internal consistency reliability of the instrument. In statistics, internal consistency indicates whether multiple items developed to measure the same latent construct would produce similar scores (DeVellis, 2003). The internal consistency is deemed to be acceptable when Cronbach's α exceeds 0.85 (Aiken, 1997). As shown in Table IV, the observed α-values were higher than 0.85 in all the constructs. This indicates that the instrument of this study can reliably measure the identified constructs in terms of internal consistency.

Results

Effects of usefulness and ease-of-use on use intention

To answer *RQ1*, the Figure 1 model was fitted with the observations from the survey using SEM based on the maximum likelihood method. The SEM analysis exhibits an adequate model fit: $\chi^2/\mathrm{df} = 2.387$; $\mathrm{NFI} = 0.965$; and $\mathrm{RMSEA} = 0.065$ (where the diagnostic criteria are $\chi^2/\mathrm{df} < 3.00$; $\mathrm{NFI} > 0.90$; and $\mathrm{RMSEA} < 0.08$, according to Bentler and Bonett, 1980). Table V presents the parameters estimated from the SEM analysis. The result reveals that both usefulness and ease-of-use would affect the use intention of online library resources directly and indirectly. The direct effect of usefulness to use intention was significant at the α–level of 0.01 (regression weight $= 0.273$; $p < 0.01$). Both usefulness and ease-of-use also positively influence users' attitude toward online library resources (regression weights $= 0.473$ and 0.408, respectively; both $p < 0.01$). In addition, the effect of ease-of-use on usefulness also turned out to be statistically significant (standardized weight $= 0.494$; $p < 0.01$). The SEM result confirms that both usefulness and ease-of-use positively influence use intention toward online library resources. The intermediate effect of attitude turned out to be especially important as it had a strong influence on use intention (regression weight $= 0.657$; $p < 0.01$).

Effects of resource quality on use intention

Next, the causal relationships between the resource quality constructs and the use intention of online library resources were examined. High interdependency was observed between resource quality latent constructs. The SEM analysis reveals that high interdependency exists between latent variables as shown in Table VI

Table III.
Latent constructs and corresponding measurement items

Latent construct	Item code	Measurement item	References
Usefulness	*use1*	Using online library resources improves my performance in completing my academic tasks	Thong *et al.* (2002), Park *et al.* (2009) and Joo *et al.* (2011)
	use2	Using online library resources increases my productivity in completing my academic tasks	
	use3	Using online library resources enhances my effectiveness in completing my academic tasks	
	use4	Overall, online library resources are useful in completing my academic tasks	
Ease-of-use	*eou1*	The library web site is easy to operate to find online resources	Thong *et al.* (2002), Park *et al.* (2009) and Joo *et al.* (2011)
	eou2	I can complete an online resource-finding task quickly using the library web site	
	eou3	It is easy to perform finding online resources for what I need using the library web site	
Accessibility	*acc1*	Online library resources for what I am researching are accessible through the library web site	Xie and Joo (2009), Lee *et al.* (2012)
	acc2	Online library resources allow information to be readily available to me	
	acc3	I can access online library resources whenever I need to find them	
Credibility	*cre1*	I can trust the information from online library resources	Xie and Joo (2009) and Lee *et al.* (2012)
	cre2	The information obtained from online library resources is accurate	
	cre3	The information obtained from online library resources is reliable	
	cre4	Online library resources are trustworthy	
Coverage	*cvr1*	Online library resources cover a wide variety of topics	Xie and Joo (2009) and Lee *et al.* (2012)
	cvr2	Online library resources provide sufficient amount of information in the topics I am interested in	
	cvr3	Online library resources cover a wide time period of information	
Currency	*cur1*	Online library resources provide current information	Wixom and Todd (2005)
	cur2	Online library resources update recent materials on a regular basis	
	cur3	Online library resources are continuously updated	
Format	*for1*	The information provided by online library resources is well-formatted	Wixom and Todd (2005)
	for2	The information provided by online library resources is well-laid out	
	for3	The information provided by online library resources is clearly presented on the screen or in a printable format	
Attitude	*att1*	I have a favorable attitude toward using online library resources	Thong *et al.* (2002) and Park *et al.* (2009)
	att2	I believe it is a good idea to use online library resources for my academic tasks	
	att3	I like the idea of using online library resources for my coursework or research	
Use intention	*int1*	I intend to continue using online library resources rather than discontinue their use	Hu *et al.* (2009)
	int2	My intentions are to continue using online library resources over any alternative means	
	int3	I would like to continue using online library resources	

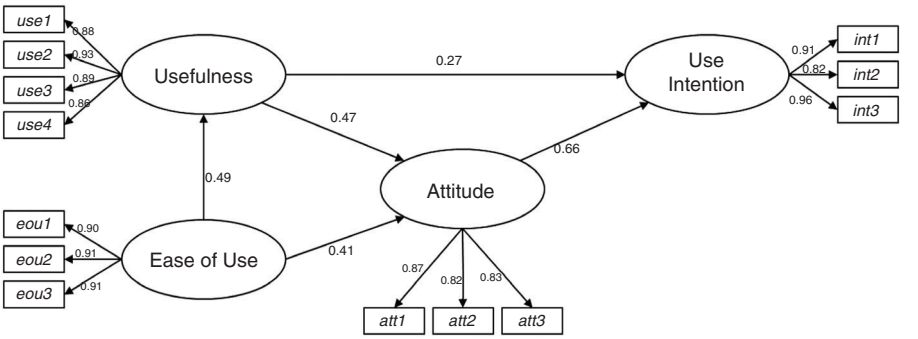

Figure 1.
Parameters estimated for the *RQ1* research model

Construct (variables)	Construct-level α	Overall α
Usefulness (*use1-4*)	0.930	0.962
Ease-of-use (*eou*1-3)	0.938	
Accessibility (*acc1-3*)	0.862	
Credibility (*cre1-4*)	0.962	
Coverage (*cvr1-3*)	0.869	
Currency (*cur1-3*)	0.868	
Format (*for1-3*)	0.928	
Attitude (*att1-3*)	0.875	
Use intention (*int1-3*)	0.921	

Table IV.
Cronbach's α test result

Parameter to be estimated	Unstandardized regression weight	Standardized regression weight	Sig.
Usefulness ←ease-of-use	0.475	0.494	$p < 0.01$
Attitude←ease-of-use	0.387	0.408	$p < 0.01$
Attitude←usefulness	0.467	0.473	$p < 0.01$
Use intention←usefulness	0.252	0.273	$p < 0.01$
Use intention←attitude	0.612	0.657	$p < 0.01$
int1←use intention	1.000[a]	0.909	–
int2←use intention	1.011	0.818	$p < 0.01$
int3←use intention	1.079	0.956	$p < 0.01$
att1←attitude	1.000[a]	0.832	–
att2←attitude	0.819	0.825	$p < 0.01$
att3←attitude	0.973	0.867	$p < 0.01$
use1←usefulness	1.000[a]	0.879	–
use2←usefulness	1.018	0.933	$p < 0.01$
use3←usefulness	0.953	0.887	$p < 0.01$
use4←usefulness	1.005	0.864	$p < 0.01$
eou1←ease-of-use	1.000[a]	0.910	–
eou2←ease-of-use	1.045	0.906	$p < 0.01$
eou3←ease-of-use	1.001	0.895	$p < 0.01$

Table V.
SEM analysis results for usefulness and ease-of-use

Note: [a]Indicates a parameter fixed at 1.0 in the original solution

(χ^2/df = 2.443; NFI = 0.952; and RMSEA = 0.066, where the diagnostic criteria are χ^2/df < 3.00; NFI > 0.90; and RMSEA < 0.08; Bentler and Bonett, 1980). In several pairs of constructs, the correlation coefficients were higher than 0.6, which implies a strong dependency. Due to the collinearity among exogenous latent variables, SEM was not appropriate in this case.

To avoid the interdependency problem, a factor score was used to represent each resource quality construct. A factor score is a numerical value that represents a latent factor (Fidell and Tabachnick, 2006). To compute factor scores, a factor analysis was conducted using the varimax method with the observed variables of the five resource quality constructs, namely accessibility, credibility, coverage, currency, and format. The Kaiser-Meyer-Olkin measure of Sampling Adequacy and Bartlett's test ($KMO = 0.915$) of Sphericity ($\chi^2 = 4659.01$; df = 120; $p < 0.01$) indicate the collected data are adequate for factor analysis. The five components accounted for approximately 84 percent of the total variance. Since the factor scores were calculated based on an orthogonal rotation, the varimax method, the collinearity problem was resolved. The Scree plot shows an elbow between the fifth and sixth component generations (Figure 2), so the five factor model was accepted in the study. The factor analysis result indicates that the observed variables well represent resource quality constructs as intended by showing factor loadings higher than 0.6 (Table VII). With the factor scores representing the five quality components, a multiple regression was conducted.

	Credibility	Coverage	Currency	Format
Accessibility	0.574*	0.694*	0.510*	0.624*
Credibility		0.628*	0.477*	0.477*
Coverage			0.625*	0.626*
Currency				0.615*

Note: *$p < 0.01$

Table VI.
Correlation estimates between constructs

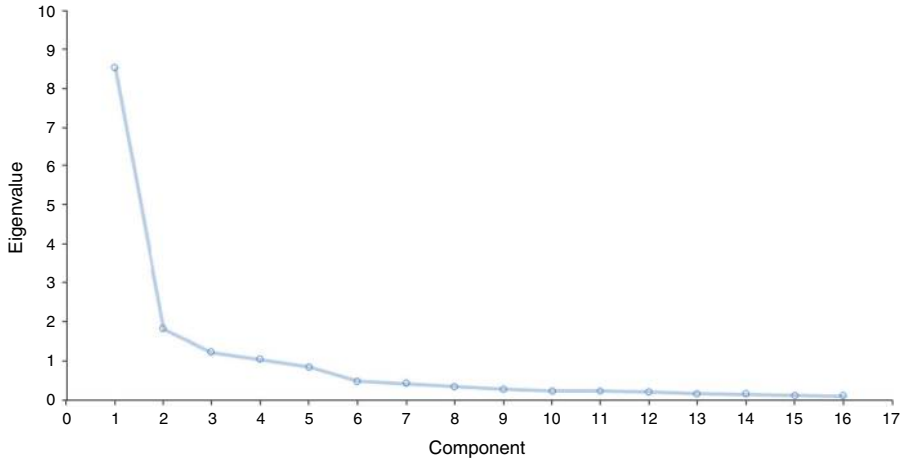

Figure 2.
Scree plot

	Component				
	Credibility	Format	Accessibility	Currency	Coverage
cre4	0.891				
cre2	0.889				
cre3	0.879				
cre1	0.849				
for1		0.862			
for2		0.838			
for3		0.810			
acc2			0.843		
acc1			0.762		
acc3			0.749		
cur2				0.869	
cur3				0.868	
cur1				0.608	
cvr1					0.817
cvr2					0.751
cvr3					0.716

Table VII. Rotated matrix of factor loadings based on varimax rotation

The multiple regression result reveals that all the five factors positively affect users' use intention of online library resources at the α-level of 0.01. Table VIII shows the regression result with standardized regression weights (β's). An adjusted R^2 of 0.391 was achieved, which indicates approximately 39 percent of the variance of use intention was accounted for by those five constructs of resource quality. Interestingly, accessibility turned out to be most influential to the use intention of online library resources by showing $\beta = 0.391$ ($p < 0.01$). The influence of format was the next highest factor, showing $\beta = 0.320$ ($p < 0.01$). The predictors of credibility and coverage turned out to be less influential to online library resource use intention by showing $\beta = 0.211$ ($p < 0.01$) and $\beta = 0.220$ ($p < 0.01$), respectively. This implies that undergraduate students consider availability more important than credibility and coverage when selecting online library resources.

Effects of user individual differences on use intention of online library resources

As to individual use differences, four factors were investigated: gender; familiarity with system; library instruction experience; and information search skill.

First, the effect of gender on users' intention to use online library resources was examined. An independent *t*-test was conducted to compare the means of the two gender groups, i.e., male and female students. Table IX presents the *t*-test result

	Unstandardized regression weights (B)	Standardized regression weight (β)	t	Sig.
(Constant)	5.504		104.184	$p < 0.01$
Credibility	0.257	0.211	4.887	$p < 0.01$
Format	0.391	0.320	7.404	$p < 0.01$
Accessibility	0.476	0.391	9.032	$p < 0.01$
Currency	0.278	0.229	5.281	$p < 0.01$
Coverage	0.268	0.220	5.082	$p < 0.01$

Table VIII. Multiple regression – the effects of resource quality factors on use intention

comparing the male and female groups. The mean difference shows that the female student group has higher use intention (5.635) than the male group (5.266). However, the *t*-test statistics indicated no significant difference between the groups at the α-value of 0.05. That is, there was no gender effect on the library resource use intention.

Second, the relationship between familiarity with online library resources and use intention was examined. The original survey item investigated respondents' familiarity using five categories, ranging from not familiar at all to extremely familiar. However, there were not many responses to the two extreme bipolar choices, so we recoded the five categories into three – "not at all familiar or unfamiliar," "moderately familiar," and "very familiar or extremely familiar." An ANOVA test was conducted with the recoded responses. Table X presents the mean comparison among three groups as well as the ANOVA test statistics. A significant mean difference was observed among the three groups at the α-level of 0.01. Participants who answered "very or extremely familiar" exhibited the highest use intention (6.17) compared to the other groups (5.74 and 4.95, respectively). This reveals that familiarity with online library resources affects students' selection of resources. A *post hoc* test based on the Tukey method confirmed that mean differences were significant between all the pairs of groups at the α-level of 0.05 (Table XI).

Third, the study looked into whether library instruction experience would influence the use intention. A *t*-test was carried out to statistically examine the effect of library instruction program experience. Two groups were identified: those who had participated in at least one library instruction program at the college level and those one who had not. Table XII shows the *t*-test result that examined the mean difference between the two groups by library instruction program experience. No significant mean difference was found between two groups at the α-level of 0.05. That is, library

Group	Mean	STD	Statistics
Male	5.27	1.308	$t = -2.691$ (df = 329) $p > 0.05$
Female	5.64	1.141	

Table IX. *t*-test result – the effect of gender on use intention

Group	Mean	STD	Statistics
Unfamiliar or not at all familiar	4.95	1.216	$F = 29.565$ (df = 2; 328) $p < 0.01$
Moderately familiar	5.74	1.127	
Very or extremely familiar	6.17	0.861	

Table X. ANOVA test – the effect of familiarity on use intention

Group	Mean difference[a]	Tukey test
"Unfamiliar or not at all familiar" vs "moderately familiar"	0.795	$p < 0.01$
"Unfamiliar or not at all familiar" vs "very or extremely familiar"	1.219	$p < 0.01$
"Moderately familiar" vs "very or extremely familiar"	0.434	$P < 0.05$

Note: [a]Absolute value

Table XI. *Post hoc* test (Tukey test)

instruction program experience was not associated with online library resource use intention.

Fourth, the effect of information search skills on online library resource use intention was investigated. Since the level of search skills was measured using a numerical scale, a linear regression was applicable. The regression result reveals that search skills have a significant impact on use intention (Table XIII). An adjusted R^2 of 0.144 was achieved. The standardized regression weight turned out 0.383 ($p < 0.01$), which represents a moderate causal relationship between two variables. This implies that undergraduates with higher level search skills showed higher use intention of online library resources.

Discussion

The results of this study demonstrate that multiple factors influence online library resource selection behavior of undergraduate students simultaneously. This study comprehensively covers a variety of factors in three different aspects that could affect college students' selection of online library resources. The findings of this study can be useful to better understand the underlying reasons of college students' selection of online library resources from the perspective of both the resources (*RQ1* and *RQ2*) and users themselves (*RQ3*).

This study yielded two theoretical implications in understanding undergraduates' online library resource uses. One of the theoretical contributions of the present study lies in that it adopted TAM in the context of online library resources. There were a few attempts to apply TAM in the environment of digital library systems (e.g. Thong *et al.*, 2002; Park *et al.*, 2009). Those previous studies focussed on system features of digital libraries. Comparatively, less research has been done to employ the TAM framework to understand online resource usage of undergraduate students in academic libraries. Online library resources are a broader concept that includes various types of electronic sources available through an academic library, such as electronic journals, e-books, electronic periodicals and theses and dissertations in digital format, not limited to digital collections stored in a digital library. TAM has proven to be an effective research framework to examine the selection of technology focussing on usefulness and ease-of-use in different information system situations (Chuttur, 2009). As the online information services of academic libraries can be regarded as a sort of information system, TAM could serve as a convincing framework to explain the selection of online library resources involving the two factors of usefulness and ease-of-use.

Table XII.
t-test result – the effect of library instruction program on use intention

Group	Mean	STD	Statistics
Experience in library instruction program	5.47	1.286	$t = -0.368$ (df = 329) $p > 0.05$
No experience in library instruction program	5.52	1.143	

Table XIII.
The effect of information search skills on use intention

Model	Unstandardized weight (B)	Standardized weight (β)	t	Sig.
(Constant)	3.490		12.725	$p < 0.01$
Information search skill	0.356	0.383	7.514	$p < 0.01$

Another theoretical contribution lies in the fact that this study has identified five constructs of online library resource quality, and going further, it empirically tested the effects of those constructs on undergraduate resource selection. Previously, researchers suggested different dimensions of online resource quality in various areas (e.g. Rieh, 2002; DeLone and McLean, 1992; Arazy and Kopak, 2011; Stvilia *et al.*, 2009), but few of them tried to empirically examine the effect of multiple aspects of resource quality quantitatively in the context of online library resources. A few previous researchers identified multiple factors of resource quality holistically (Xie and Joo, 2009; Lee *et al.*, 2012), but most of them used a qualitative approach or descriptive statistics, not inferential multivariate statistics. The authors of this study conducted a multiple regression involving five key constructs under resource quality in an attempt to comprehensively examine the effect of multiple factors, and in this way, contributed to the understanding of undergraduates' unique selection behavior of online library resources.

In addition, the findings derived from the three research questions produced practical implications for the increase of undergraduates' use of library resources.

First, the confirmation of *RQ1* implies that both usefulness and ease-of-use serve as the fundamental factors in selection of online resources in academic libraries. Usefulness is closely related to students' completion of academic tasks using library resources, and it has been shown that college students perceive information sources from academic libraries to be relevant and useful to their class assignments or class-related projects (Lee *et al.*, 2012). To encourage undergraduate students to use online resources from academic libraries, instructors and professors should impress upon students the benefits of using library resources by emphasizing that those resources are valuable and suitable sources for their academic tasks. The *RQ1* also reveals that ease-of-use positively influences both usefulness and attitude, which eventually led to the increased use intention of online library resources. In particular, ease-of-use is closely associated to students' positive attitude. One implication is the need for easy-to-use academic library web systems. Academic libraries should consider designing library web systems that replicate the web environment so that the systems could be perceived as easy-to-use for novice users including undergraduate students (Connaway *et al.*, 2011). Ease-of-use is also related to search efficiency. How quickly students believe they can find information determines where they look for it. If students do not find information within a few clicks, it might not be regarded as easy-to-use for them. This is, in part, because they grew up with the ability to quickly access information via the internet. If they cannot obtain the information promptly, they are less likely to continue to use the system. Because of college students' preference for web searching and growing up as digital natives (Timpson and Sansom, 2011), academic library systems could benefit from developing Google-like interfaces and other convenient features of commercial web systems.

Second, this study confirmed the effect of resource quality on use intention of online library resources (*RQ2*). Based on the previous literature, five constructs were identified: credibility, format, accessibility, currency, and coverage. All those five resource quality constructs influenced use intention positively. Interestingly, the effect of accessibility ($\beta = 0.391$) was higher than that of credibility ($\beta = 0.211$). This finding reaffirmed previous studies claiming that undergraduates tend to put more weight on accessibility than credibility in resource selection (Connaway *et al.*, 2011; Colón-Aguirre and Fleming-May, 2012; Kim and Sin, 2011). That is, the degree to which the online

library resources are accessible is an important factor in determining whether or not college students are willing to use the resources. It suggests that making library resources more readily accessible online can be a key to assisting undergraduate students in obtaining required information to satisfy their needs (Biddix *et al.*, 2011). In particular, because many students tend to search for information at the last minute for their class assignments, instant accessibility of online resources could be significantly appealing (Lee, 2008). One drawback of a preference for easily accessible sources is that credibility is sometimes scarified in the name of finding information quickly. Although undergraduates appeared to appreciate the importance of credibility when they chose information sources for their classwork, they still seemed to prefer the immediate advantage of accessibility over credibility (Kim and Sin, 2011). Since many library materials come from reliable publishers and authoritative entities, library resources are usually perceived as credible compared to other competing digital media (Lee *et al.*, 2012). In particular, online library resources include peer-reviewed materials such as electronic journals and book chapters. To increase the potential use of online library resources by undergraduate students, guiding them to select such credible and accurate sources should be prioritized in college-level information literacy education.

In *RQ2*, the study also found that coverage and currency were significant determinants of online library resource selection. In other words, students were more likely to use online library resources if the resources covered more varied topics and contained up-to-date information. This has practical implications for the online collection development practices of academic libraries. Academic library collections should give emphasis to a wide range of topics as well as regularly update their materials. Additionally, a causal relationship between resource format and use intention of online library resources was also observed. In the context of online library resources, resource format is concerned with the file format of documents provided for end users. There is little room for libraries to adapt here; vendors control the file format of most online resources, especially for electronic journal articles and books. However, academic libraries can still enhance the interface layout of their OPAC and integrated search system based on user experience analysis.

Third, this study investigated the effect of user differences in online library resource selection (*RQ3*). The results revealed that familiarity and search skills were significantly associated with students' use intention of online library resources. This reaffirms Kim and Sin's (2011) findings that familiarity with a source is a determinant as to whether or not students use it. Users are likely to continue to use the resources that are familiar to them even though they are aware that better information sources are available. To get students to become more familiar with the sources provided by academic libraries, library interfaces need to look familiar to undergraduates by resembling popular web system interfaces. Closer integration of such interfaces with library search systems could increase familiarity with library sources for undergraduate users. Information literacy education is another option that can raise students' familiarity with online library resources: it can expose students directly to online library resources during literacy education sessions. Interestingly, search skills turned out to be another significant factor in *RQ3*. That is, students with higher search skills were likely to use online library resources more frequently. In general, academic library systems are more complex to use than web search engines (Martin, 2008), and searching in a library system requires more skills to find needed information. Thus, we can expect that students with less search skills might not like to use complex library

systems, but go to convenient web search engines instead. For this reason, it is important to elevate students' search skills by providing information literacy education involving library systems. In this way, at the individual student level, information literacy education can be a compelling solution to increase both resource familiarity and search skills of undergraduate students, which have a positive impact on use intention of online library resources.

However, there was no significant effect of gender on use intention of online library resources. Gender effect has been controversial in information seeking behavior research. Some previous studies showed that there are different patterns of resource selection behavior by gender (e.g. Lim and Kwon, 2010; Maghferat and Stock, 2010). Other researchers argued that there is no difference in habitual use of electronic resources and search behavior between men and women (e.g. Urquhart and Yeoman, 2010). This study did not find a significant gender gap in terms of online library resource use intention. This study also found that library instruction was not a significant factor in online library resource selection. This finding reaffirms some of the previous studies. For example, Martin's (2008) study revealed that students who attended a library instruction session were proportionately just as likely to use both academic and non-academic sources as those students who did not attend. Similarly, Currie *et al.* (2010) found that a library instruction session would not be enough to positively affect students' information search behavior. This result is partially because one-time training sessions might not be sufficient to impact the necessity skills required to use online library resources effectively. Kim and Sin (2011) suggested that library instruction should be repeated until users are comfortable with using the library systems. They recommended that the instruction be embedded in actual courses and integrated into the curriculum. The course-integrated library instruction may be an appropriate solution to bring about a positive effect on online library resource usage. For example, Atwong and Heichman-Taylor's (2008) study demonstrated that faculty-library cooperation in a class could increase students' ability to effectively use library online databases. In this sense, library instruction needs to be incorporated across the university curriculum to some degree. To do that, academic librarians need to collaborate with instructors to integrate information literacy education into the classroom.

Conclusion

This study examined three dimensions of factors affecting undergraduates' online library resource selection. First, the results confirmed TAM can be acceptable in the context of online library resources. The findings showed that usefulness had both direct and indirect significant effects on use intention of online library resources, while ease-of-use had a significant indirect impact on use intention intermediated by attitude and usefulness. Second, significant causal relationships were observed between five resource quality constructs – credibility, format, accessibility, currency, and coverage – and use intention. Interestingly, the effect of accessibility was the strongest, while that of credibility was the weakest. Third, familiarity with resources and high-search skills both had significant effects on use intention of online library resources, whereas users' gender or library instruction experience did not. Theoretically, this study strove to look into different dimensions of multiple factors to understand undergraduates' online library resource selection. Also, the findings of the study yielded insight into how to increase the undergraduates' use intention of online library resources.

Although this study made some theoretical and practical contributions, it has some limitations that should be acknowledged. First of all, this study relied only on quantitative analysis. It empirically tested the relationships between variables of interest. However, it did not explain the details of some reasons underlying online library resource selection. Second, this study investigated only the factors positively contributing to online library resource selection, but did not explore negative factors hindering online library resource use. These limitations indicate a need for further research that explores both positive and negative factors in understanding online library resource selection. Understanding negative factors would be especially helpful in coming up with strategies to help students use online library resources by removing possible hindrances. Future research could also expand the survey participants to graduate students to compare unique online library resource selection behavior between the two groups. The findings of the present and potential future studies may result in further insights regarding ways to encourage students to increase their online library resource use for academic tasks.

References

Aiken, L.R. (1997), *Psychological Testing and Assessment*, Allyn & Bacon, Boston, MA.

Arazy, O. and Kopak, R. (2011), "On the measurability of information quality", *Journal of the American Society for Information Science and Technology*, Vol. 62 No. 1, pp. 89-99.

Atwong, C.T. and Heichman-Taylor, L.J. (2008), "Integrating information literacy into business education: a successful case of faculty-librarian collaboration", *Journal of Business & Finance Librarianship*, Vol. 13 No. 4, pp. 433-448.

Badke, W. (2013), "Infolit land: the path of least resistance", *Online Searcher*, Vol. 37 No. 2, pp. 65-67.

Bentler, P.M. and Bonett, D.G. (1980), "Significance tests and goodness of fit in the analysis of covariance structures", *Psychological Bulletin*, Vol. 88 No. 3, pp. 588-606.

Biddix, J.P., Chung, C.J. and Park, H.W. (2011), "Convenience or credibility? A study of college student online research behaviors", *The Internet and Higher Education*, Vol. 14 No. 3, pp. 175-182.

Carrier, M.R., Dalessio, A.T. and Brown, S.H. (1990), "Correspondence between estimates of content- and criterion-related validity values", *Personnel Psychology*, Vol. 43 No. 1, pp. 85-100.

Chuttur, M. (2009), "Overview of the technology acceptance model: origins, developments and future directions", *Sprouts: Working Papers on Information Systems*, Vol. 9 No. 37, pp. 1-21.

Colón-Aguirre, M. and Fleming-May, R.A. (2012), "You just type in what you are looking for: undergraduates' use of library resources vs Wikipedia", *The Journal of Academic Librarianship*, Vol. 38 No. 6, pp. 391-399.

Connaway, L.S., Dickey, T.J. and Radford, M.L. (2011), "If it is too inconvenient i'm not going after it: convenience as a critical factor in information-seeking behaviors", *Library & Information Science Research*, Vol. 33 No. 3, pp. 179-190.

Connaway, L.S., Radford, M.L., Dickey, T.J., De Angelis Williams, J. and Confer, P. (2008), "Sense-making and synchronicity: information-seeking behaviors of millennials and baby boomers", *Libri*, Vol. 58 No. 2, pp. 123-135.

Currie, L., Devlin, F., Emde, J. and Graves, K. (2010), "Undergraduate search strategies and evaluation criteria: searching for credible sources", *New Library World*, Vol. 111 Nos 3/4, pp. 113-124.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-340.

Denison, D.R. and Montgomery, D. (2012), "Annoyance or delight? College students' perspectives on looking for information", *The Journal of Academic Librarianship*, Vol. 38 No. 6, pp. 380-390.

DeLone, W.H. and McLean, E.R. (1992), "Information systems success: the quest for the dependent variable", *Information Systems Research*, Vol. 3 No. 1, pp. 60-95.

DeVellis, R.F. (2003), *Scale Development: Theory and Applications*, Sage Publication, Thousand Oaks, CA.

Fidell, L.S. and Tabachnick, B.G. (2006), *Using Multivariate Statistics*, 5th ed., Harper and Row, New York, NY.

Griffiths, J.R. and Brophy, P. (2005), "Student searching behavior and the web: use of academic resources and Google", *Library Trends*, Vol. 53 No. 4, pp. 539-554.

Haglund, L. and Olsson, P. (2008), "The impact on university libraries of changes in information behavior among academic researchers: a multiple case study", *The Journal of Academic Librarianship*, Vol. 34 No. 1, pp. 52-59.

Head, A.J. and Eisenberg, M.B. (2010), "How today's college students use wikipedia for course-related research", *First Monday*, Vol. 15 No. 3.

Holman, L. (2011), "Millennial students' mental models of search: implications for academic librarians and database developers", *The Journal of Academic Librarianship*, Vol. 37 No. 1, pp. 19-27.

Hu, P.J.-H., Brown, S.A., Thong, J.Y.L., Chan, F.K.Y. and Tam, K.Y. (2009), "Determinants of service quality and continuance intention of online services: the case of eTax", *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 2, pp. 292-306.

Joo, S. and Lee, J.Y. (2011), "Measuring the usability of academic digital libraries: instrument development and validation", *The Electronic Library*, Vol. 29 No. 4, pp. 523-537.

Joo, S., Lin, S. and Lu, K. (2011), "A usability evaluation model for academic library websites: efficiency, effectiveness and learnability", *Journal of Library and Information Studies*, Vol. 9 No. 2, pp. 11-26.

Kim, K.S. and Sin, S.C.J. (2011), "Selecting quality sources: bridging the gap between the perception and use of information sources", *Journal of Information Science*, Vol. 37 No. 2, pp. 178-188.

Lee, H.L. (2008), "Information structures and undergraduate students", *The Journal of Academic Librarianship*, Vol. 34 No. 3, pp. 211-219.

Lee, J.Y., Paik, W. and Joo, S. (2012), "Information resource selection of undergraduate students in academic search tasks", *Information Research: An International Electronic Journal*, Vol. 17 No. 1.

Lim, S. (2009), "How and why do college students use Wikipedia?", *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 11, pp. 2189-2202.

Lim, S. and Kwon, N. (2010), "Gender differences in information behavior concerning wikipedia, an unorthodox information source?", *Library & Information Science Research*, Vol. 32 No. 3, pp. 212-220.

Maghferat, P. and Stock, W.G. (2010), "Gender-specific information search behavior", *Webology*, Vol. 7 No. 2.

Malliari, A., Korobili, S. and Zapounidou, S. (2011), "Exploring the information seeking behavior of greek graduate students: a case study set in the University of Macedonia", *The International Information & Library Review*, Vol. 43 No. 2, pp. 79-91.

Martin, J. (2008), "The information-seeking behavior of undergraduate education majors: does library instruction play a role?", *Evidence Based Library and Information Practice*, Vol. 3 No. 4, pp. 4-17.

Metzger, M.J., Flanagin, A.J. and Zwarun, L. (2003), "College student web use, perceptions of information credibility, and verification behavior", *Computers & Education*, Vol. 41 No. 3, pp. 271-290.

Nunnally, J.C. and Bernstein, I.H. (1994), *Psychometric Theory*, McGraw-Hill, New York, NY.

Park, N., Roman, R., Lee, S. and Chung, J.E. (2009), "User acceptance of a digital library system in developing countries: an application of the technology acceptance model", *International Journal of Information Management*, Vol. 29 No. 3, pp. 196-209.

Rieh, S.Y. (2002), "Judgment of information quality and cognitive authority in the web", *Journal of the American Society for Information Science and Technology*, Vol. 53 No. 2, pp. 145-161.

Rieh, S.Y. and Hilligoss, B. (2007), "College students' credibility judgments in the information seeking process", in Metzger, M. and Flanigan, A. (Eds), *Digital Media, Youth, and Credibility*, The MIT Press, Cambridge, MA, pp. 49-72.

Selwyn, N. (2008), "An investigation of differences in undergraduates' academic use of the internet", *Active Learning in Higher Education*, Vol. 9 No. 1, pp. 11-22.

Stvilia, B., Mon, L. and Yi, Y.J. (2009), "A model for online consumer health information quality", *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 9, pp. 1781-1791.

Thong, J.Y., Hong, W. and Tam, K.Y. (2002), "Understanding user acceptance of digital libraries: what are the roles of interface characteristics, organizational context, and individual differences?", *International Journal of Human-Computer Studies*, Vol. 57 No. 3, pp. 215-242.

Timpson, H. and Sansom, G. (2011), "A student perspective on e-resource discovery: has the Google factor changed publisher platform searching forever?", *The Serials Librarian*, Vol. 61 No. 2, pp. 253-266.

Twait, M. (2005), "Undergraduate students' source selection criteria: a qualitative study", *The Journal of Academic Librarianship*, Vol. 31 No. 6, pp. 567-573.

Urquhart, C. and Yeoman, A. (2010), "Information behavior of women: theoretical perspectives on gender", *Journal of Documentation*, Vol. 66 No. 1, pp. 113-139.

Wixom, B.H. and Todd, P.A. (2005), "A theoretical integration of user satisfaction and technology acceptance", *Information Systems Research*, Vol. 16 No. 1, pp. 85-102.

Xie, I. and Joo, S. (2009), "Selection of information sources: types of tasks, accessibility and familiarity of sources", *Proceedings of the Annual American Society for Information Science and Technology*, Vol. 46 No. 1, pp. 1-18.

Zimerman, M. (2012), "Digital natives, searching behavior and the library", *New Library World*, Vol. 113 Nos 3/4, pp. 174-201.

About the authors

Dr Soohyung Joo is an Assistant Professor in the School of Library and Information Science at the University of Kentucky. He obtained his PhD in information studies from the University of Wisconsin-Milwaukee. His research areas are digital library, information retrieval, data analytics, library information systems, and electronic resource usage. His research work has been

published in academic journals, including the *Journal of the Association for Information Science and Technology*, *Information Processing and Management*, and *Information Research*. Dr Soohyung Joo is the corresponding author and can be contacted at: soohyung.joo@uky.edu

Namjoo Choi is an Assistant Professor at the School of Library and Information Science, the University of Kentucky. He received his PhD in informatics from the University at Albany, State University of New York. His research interests include open source software, virtual communities, technology adoption, and post-adoption. His research work has been published in a number of scholarly journals, including the *Journal of the Association for Information Science and Technology*, *IEEE Software*, and *Library Hi Tech*.

This article has been cited by:

1. Jiming Hu Center for the Study of Information Resources of Wuhan University Wuhan China Yin Zhang Kent State University Kent United States MichaelS. Seadle Humboldt Universität zu Berlin Berlin Germany United States MichaelS. Seadle Humboldt Universität zu Berlin Berlin Germany United States . 2016. Chinese students' behavior intention to use mobile library apps and effects of education level and discipline. *Library Hi Tech* **34**:4. . [Abstract] [PDF]
2. Hye-Young Yoon. 2016. User Acceptance of Mobile Library Applications in Academic Libraries: An Application of the Technology Acceptance Model. *The Journal of Academic Librarianship* . [CrossRef]
3. Chris Leeder, Chirag Shah. 2016. Practicing Critical Evaluation of Online Sources Improves Student Search Behavior. *The Journal of Academic Librarianship* **42**:4, 459-468. [CrossRef]
4. Xianjin Zha School of Information Management, Wuhan University, Wuhan, China Li Li School of Information Management, Wuhan University, Wuhan, China Yalan Yan School of Management, Wuhan University of Science and Technology, Wuhan, China Qian Wang School of Information Engineering, Hubei University of Economics, Wuhan, China Gang Wang School of Information Management, Wuhan University, Wuhan, China . 2016. Exploring digital library usage for getting information from the ELM perspective. *Aslib Journal of Information Management* **68**:3, 286-305. [Abstract] [Full Text] [PDF]