

Exploring digital library usage for getting information from the ELM perspective

The moderating effect of information need

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Abstract

Purpose – The elaboration likelihood model (ELM) provides a general framework for understanding the basic processes underlying the effectiveness of persuasion. The purpose of this paper is to utilize the ELM to understand the basic processes underlying the effectiveness of persuasion to use digital libraries for getting information.

Design/methodology/approach – The survey data collection was conducted in one comprehensive university. The partial least squares structured equation modelling was employed to verify the research model.

Findings – Source credibility and reputation have positive effects on information usefulness which further significantly impacts digital library usage for getting information. The effect of information quality on information usefulness is overpowered by reputation. Information need positively moderates the effect of information quality on information usefulness and negatively moderates the effect of reputation on information usefulness.

Practical implications – Digital libraries enormously influence the way how individuals gather information over the world. However, the important status of digital libraries as conventional information sources in practice invites appreciation by more and more people. The authors believe the findings of this study provide useful insights for facilitating digital libraries to be fully accessed and utilized.

Originality/value – This study explores the effects of the central route (information quality) and the peripheral route (source credibility and reputation) on digital library usage for getting information by extending the ELM with information need as a motivation variable, presenting a new lens for digital library research and practice alike.

Keywords China, Digital libraries, Reputation, Information quality, Information need, Elaboration likelihood model

Paper type Research paper



1. Introduction

As the extension of traditional physical libraries, digital libraries can deliver information collection and associated services to individuals by utilizing various information and communication technologies, with the final aim of facilitating human knowledge to be fully accessed and utilized by people based on their own need anytime anywhere (Cheng, 2014; Heradio *et al.*, 2012; Zha *et al.*, 2015c). Digital libraries have gone “from a curiosity to mainstream” over the last three decades (Arms, 2012, p. 579), having become important information sources in support of research, teaching and learning (Xie *et al.*, 2014). In China, digital libraries in universities have developed substantially since the China Academic Library and Information System (CALIS) was initiated by the Ministry of Education in 1998. One achievement of CALIS lies in having introduced and created many Chinese and English academic databases which cover diversified disciplines and subjects (Zha *et al.*, 2015c).

Many prior studies have examined digital libraries, taking as their focus users' perception of digital libraries from the cognitive style perspective (Frias-Martinez *et al.*, 2008), the effect of limited access to digital libraries on female students' performance in research work (Arif and Kanwal, 2009), acceptance of a digital library system in developing countries from the technology acceptance model (TAM) perspective (Park *et al.*, 2009), multilingual need and expectation for digital libraries (Wu *et al.*, 2012), intention to continue using digital libraries from the perspectives of expectation-confirmation model, TAM and updated information system success model (Cheng, 2014), information need of large-scale digital library users (Zavalina and Vassilieva, 2014), the effect of psychological factors and mobile context factors on digital library adoption (Zha *et al.*, 2015a), and the effects of usefulness and ease-of-use, resource quality, and individual differences on undergraduates' selection of online library resources in academic tasks (Joo and Choi, 2015).

The elaboration likelihood model (ELM) which was proposed by Petty and Cacioppo (1986) provides a general framework for understanding the basic processes underlying the effectiveness of persuasion. Elaboration refers to the extent to which individuals think about the information provided. When various factors foster individuals to have motivation and ability to process information carefully, the elaboration likelihood is at a high level (Cacioppo and Petty, 1984). Information need describes the amount of information individuals perceive they further need so as to handle a given task (Lu and Yuan, 2011). It is reasonable to suggest that information need is an important motivation variable given information need increases elaboration likelihood.

Information need is much related to information literacy which was defined as a set of abilities requiring individuals to “be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (American Library Association, 1989, p. 1). Lacking information literacy makes most students who are aware of the existence of digital resources in libraries do not know how to search, compare and use them (Ukachi, 2015). Getting information which concerns searching, comparing and evaluating information needed (Pavlou and Fygenson, 2006; Yan *et al.*, 2015), reflects the core components of information behaviour which was described by Wilson (2000) as “the totality of human behavior in relation to sources and channels of information” (p. 49). The current study employs the ELM as theoretical support to explore the effects of the central route (information quality) and the peripheral route (source credibility and reputation) on digital library usage for

getting information with information need as a motivation variable. The research questions guiding this exploration are:

- RQ1.* What are the effects of information quality, source credibility and reputation on information usefulness?
- RQ2.* Which factor is more important in determining information usefulness: information quality, source credibility or reputation?
- RQ3.* Would information usefulness lead to digital library usage for getting information?
- RQ4.* How would information need moderate the effect of the central route (information quality) on information usefulness?
- RQ5.* How would information need moderate the effect of the peripheral route (source credibility and reputation) on information usefulness?
- RQ6.* What are the effects of gender, age, position, field and experience with digital libraries on digital library usage for getting information?

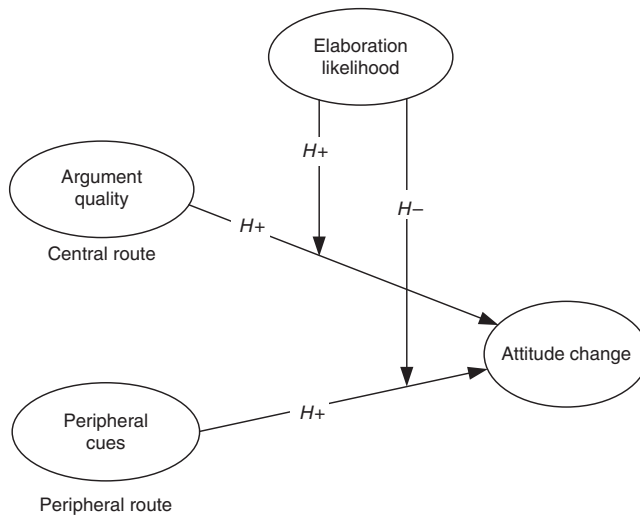
This study explores the basic processes underlying the effectiveness of persuasion to use digital libraries for getting information by extending the ELM with information need as a motivation variable, which we suggest presents a new lens for digital library research and practice alike. Following this introduction, the theoretical background is reviewed and the research model and hypotheses are developed. After that, the method and data collection are described. Finally, the results of the research are reported and the implications discussed.

2. Theoretical background and research model

2.1 ELM

The ELM is an important theory in social psychology, proposed by Petty and Cacioppo (1984, 1986) who outlined a general theory of communication-induced attitude change. Attitudes refer to individuals' global evaluations of various issues, objects and people. The ELM provides a framework for understanding the basic processes which underlie the effectiveness of persuasion and attitude change (Petty and Cacioppo, 1986). Figure 1 illustrates the essence of the ELM.

Elaboration refers to the extent to which individuals think about the arguments contained in a message (information). Unlike prior cognitive response approaches, the ELM views various factors and the combination of factors as determining individuals' motivation and ability to carefully and thoughtfully consider the true merits of the information provided. When individuals are fostered to have motivation and ability to process arguments and information carefully, the elaboration likelihood is at a high level (Cacioppo and Petty, 1984). The ELM postulates two routes to persuasion, with a continuum of message (information) elaboration anchored at the high end (the central route to persuasion) and the low end (the peripheral route to persuasion) (Petty and Cacioppo, 1984). Either thoughtful (central route) or non-thoughtful (peripheral route) processes can lead to attitude change. Under the central route, attitude change results from individuals' effortful cognitive activity around the true merits of the information provided based on prior experience and knowledge. Under the peripheral route, however, attitude change occurs because individuals use simple cues like source factors, affective states or relatively simple inferences to judge the validity of the

Figure 1.
ELM

information provided (Petty *et al.*, 1997). The ELM holds that the attitude change resulting from the central route is more likely to persist, resist counter-persuasion and influence behaviour. Meanwhile, the attitude change resulting from the peripheral route is suggested to be relatively temporary and susceptible (Petty and Cacioppo, 1986).

Following the ELM, there has been much research on the test and extension of the model in many fields. Bhattacharjee and Sanford (2006) examined document management system adoption, suggesting that the central route (argument quality) and the peripheral route (source credibility) have positive effects on perceived usefulness which further impacts attitude. Meanwhile, job relevance was treated as a motivation variable and user expertise as an ability variable. The results indicate that user expertise has a positive moderating effect on the central route and a negative moderating effect on the peripheral route. The moderating effects of job relevance are all positive. Zhou (2012) examined the effects of the central route (information quality and service quality) and the peripheral route (system quality, structural assurance and reputation) on initial trust in mobile banking. Self-efficacy was treated as an ability variable and it has positive moderating effects on the central route and negative moderating effects on the peripheral route. Gregory *et al.* (2013) examined the internet recruitment, suggesting that the recruitment website content (job information and organizational information) and design (website usability and website aesthetics) have positive influences on attitudes towards the recruitment website which further impacts attitudes towards the organization. Meanwhile, person-job fit was treated as an ability variable and it negatively moderates the effect of website aesthetics on attitudes towards the organization. Chou *et al.* (2015) examined knowledge adoption in virtual communities, suggesting that knowledge quality, source credibility, knowledge consensus and knowledge rating have positive impacts on knowledge adoption. Meanwhile, time pressure was treated as a motivation variable and it exerted moderating effects with different directions.

Other studies have employed the ELM as theoretical background in diversified settings, taking as their focus food risks (Frewer *et al.*, 1997), e-mails (Sussman and Siegel, 2003), physical exercise in university students (Jones *et al.*, 2003), electronic word-of-mouth (Park and Kim, 2008), software engineering tools (Lee and Xia, 2011),

tour destination (Tang *et al.*, 2012), website privacy assurance (Lowry *et al.*, 2012), online communities (Chen and Ku, 2013), personal health records (Li and Slee, 2014), nutrition label (Dong, 2015) and business intelligence reports (Alpar *et al.*, 2015). However, to the best of our knowledge, examining digital libraries from the ELM lens has been largely overlooked in the literature.

2.2 Research model and hypotheses development

The ELM provides sound theoretical support for this study which explores the effects of the central route (information quality) and peripheral route (source credibility and reputation) on digital library usage for getting information. Following the research by Sussman and Siegel (2003), information usefulness is a mediator of the digital library usage persuasion process. Meanwhile, information need is treated as a motivation variable so as to make predictions about the effects of the central route and peripheral route on information usefulness under different levels of elaboration likelihood. The research model with six constructs (latent variables) is presented in Figure 2.

Generally, information quality is defined as the quality of outputs in the form of online screens or online reports produced by information systems (IS), concerning completeness, accuracy and currency (Gorla *et al.*, 2010). Completeness refers to the degree to which IS provide all necessary information; accuracy refers to the degree to which the information produced by IS is right and correct; and currency refers to the degree to which the information produced by IS is current and up to date (Wixom and Todd, 2005). Information quality is one important dimension to measure IS success. Specifically, information quality is suggested to be able to measure the semantic success of IS (DeLone and McLean, 2003).

Digital libraries are important online information system applications with the development of the internet. In the current study, information quality is one construct which is defined as the quality of outputs digital libraries produce, concerning completeness, accuracy and currency. Information quality is the central route, reflecting the true merits of the information provided by digital libraries. Information usefulness refers to the degree to which users believe that the information in digital libraries can have a positive impact on their study/work. Sussman and Siegel (2003)

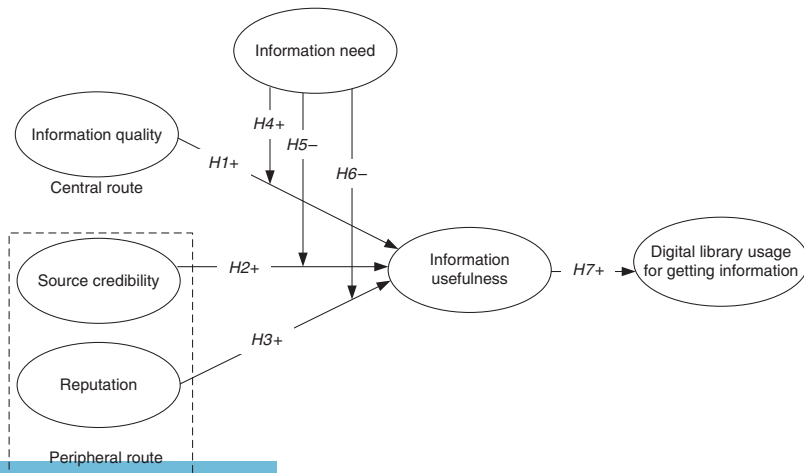


Figure 2. Research model

employed the ELM to examine information usefulness of e-mails, suggesting that argument quality (the quality of the information in e-mails) has a positive effect on information usefulness. Bhattacharjee and Sanford (2006) employed the ELM to examine document management system adoption, suggesting that argument quality (the information provided during the document management system training session) has a positive effect on perceived usefulness. Cheung (2014) examined the effect of electronic word-of-mouth on information adoption, suggesting that information quality has a positive effect on information usefulness. Zha *et al.* (2015b) explored the effects of information quality, system quality and service quality on information seeking in virtual communities. The research context concerns Baidu Know (the largest Q&A site in China), etc. The results suggest that information quality significantly impacts perceived usefulness which further leads to information seeking in virtual communities. In the context of digital libraries, it is reasonable to suggest that if users perceive information quality to be higher, they would be likely to perceive the information to be more useful. Therefore, we make the hypothesis as follows:

H1. Information quality has a positive effect on information usefulness.

Peripheral cues refer to simple cues such as source factors and affective states that are used to evaluate the content, but are not the content *per se* (Petty and Cacioppo, 1986; Petty *et al.*, 1997). Various source factors were used in prior studies, such as source credibility (Sussman and Siegel, 2003; Bhattacharjee and Sanford, 2006; Zhang *et al.*, 2014), reputation (Zhou, 2012), attractiveness (Lowry *et al.*, 2012), trustworthiness (Lowry *et al.*, 2012; Cheung, 2014) and source expertise (Yi *et al.*, 2013; Zhu *et al.*, 2014; Cheng and Ho, 2015).

Source credibility and reputation are examined in the current study where source credibility is defined as the credibility of the persons who generate information in digital libraries, reflecting nothing about the information itself. Sussman and Siegel (2003) suggested that source credibility (the person who wrote the e-mail message) has a positive effect on information usefulness. Bhattacharjee and Sanford (2006) suggested that source credibility (the person providing the document management system training) has a positive effect on perceived usefulness. Zhang *et al.* (2014) suggested that source credibility (people who left online consumer reviews) has a positive effect on purchase intention. Reputation is defined as the degree to which people believe in digital libraries' honesty towards their users and the degree to which people believe that digital libraries are known. Koufaris and Hampton-Sosa (2004) suggested that company reputation has a positive effect on initial trust. Zhou (2012) suggested that mobile banking reputation has a positive effect on initial trust. Racherla and Friske (2012) suggested that reviewers' reputation has a positive effect on consumers' perception of review usefulness. In the context of digital libraries, it is reasonable to suggest that if users perceive source credibility and reputation to be higher, they would be likely to perceive the information to be more useful. Therefore, we make the hypotheses as follows:

H2. Source credibility has a positive effect on information usefulness.

H3. Reputation has a positive effect on information usefulness.

How much cognitive effort individuals devote to processing information is determined by various individual and situational factors. These factors foster individuals' motivation and ability to process information carefully (Petty and Cacioppo, 1984). If individuals have motivation and ability to process information carefully, the elaboration likelihood is at a high level. Conversely, if individuals have

no motivation and ability to process information carefully, the elaboration likelihood is at a low level (Cacioppo and Petty, 1984; Petty and Cacioppo, 1986). The ELM listed some motivation variables such as personal relevance, need for cognition, personal responsibility as well as some ability variables such as distraction, repetition, prior knowledge, message comprehensibility (Petty and Cacioppo, 1986). Following the ELM, prior studies used various motivation and ability variables to explore the moderating effect of elaboration likelihood, such as involvement and expertise (Sussman and Siegel, 2003), job relevance and user expertise (Bhattacharjee and Sanford, 2006), self-efficacy (Zhou, 2012), person-job fit (Gregory *et al.*, 2013) and time pressure (Chou *et al.*, 2015).

Information need describes the amount of information individuals perceive they further need so as to adequately cope with a given task. It reflects “the gap between their current information about a given task and an information sufficiency threshold where individuals feel that they have obtained adequate information for decision making and have no further need for information” (Lu and Yuan, 2011, p. 135). In the current study, information need is defined as users’ need for information about the task in their study/work. It is reasonable to suggest that information need is an important motivation variable. When users have high information need, the elaboration likelihood is at a high level. In this case, users would carefully and thoughtfully consider the true merits of the information provided, resulting in the increase of the effect of the central route. Meanwhile, source factors are no more important as cues, only serving “as persuasive arguments” or helping in “interpreting arguments” (Cacioppo and Petty, 1984, p. 668). When users have low information need, the elaboration likelihood is at a low level. In this case, “source factors serve as simple acceptance or rejection cues”, resulting in the increase of the effect of the peripheral route (Cacioppo and Petty, 1984, p. 668).

The moderating effects of elaboration likelihood have been tested by many prior studies. For example, the quality of the arguments contained in a message has a greater effect on persuasion for individuals with high need for cognition (Cacioppo *et al.*, 1983). The quality of the arguments contained in e-mail messages has a greater effect on information usefulness under conditions of high involvement (Sussman and Siegel, 2003). The quality of the arguments provided during the document management system training session has a greater effect on perceived usefulness under conditions of high user expertise and job relevance (Bhattacharjee and Sanford, 2006). Information quality and service quality have greater effects on initial trust under conditions of high self-efficacy (Zhou, 2012). Conversely, peripheral cues such as the celebrity status, attractiveness or credibility of product endorsers have greater effects on persuasion under conditions of low involvement (Petty *et al.*, 1983). Source credibility has a greater effect on perceived usefulness under conditions of low user expertise (Bhattacharjee and Sanford, 2006). System quality, structural assurance and reputation have greater effects on initial trust under condition of low self-efficacy (Zhou, 2012). Website aesthetics has a great effect on attitudes towards the organization under conditions of low person-job fit (Gregory *et al.*, 2013). In the current study, it is reasonable to suggest that if users have high information need, the effect of information quality on information usefulness would become greater whereas the effects of source credibility and reputation on information usefulness would become weaker. We thus make the hypotheses as follows:

- H4. The effect of information quality on information usefulness will be positively moderated by information need such that this effect will be stronger for individuals with high information need.

- H5. The effect of source credibility on information usefulness will be negatively moderated by information need such that this effect will be weaker for individuals with high information need.
- H6. The effect of reputation on information usefulness will be negatively moderated by information need such that this effect will be weaker for individuals with high information need.

In the current study, digital library usage for getting information is defined as the actual information getting behaviour in digital libraries in respect to the frequency and the amount of time involved. The effect of information usefulness on behaviour has been tested by prior studies. For example, information usefulness has a positive effect on information adoption (Sussman and Siegel, 2003). Perceived usefulness has a positive effect on IT usage intention (Bhattacharjee and Sanford, 2006). Information usefulness leads to trust in Wikipedia which further leads to information adoption (Shen *et al.*, 2013). Information usefulness has a positive effect on consumer purchase intention (Cheung, 2014). It is reasonable to suggest that if users perceive the information provided by digital libraries to be useful, they would be more likely to use digital libraries for getting information. Therefore, we make the hypothesis as follows:

- H7. Information usefulness has a positive effect on digital library usage for getting information.

3. Method and data collection

3.1 Measures development

All the constructs and their corresponding measure items were adapted from existing research literature to fit the context of this study. Specifically, the items measuring information quality and source credibility were adapted from Bhattacharjee and Sanford (2006); the items measuring reputation were adapted from Koufaris and Hampton-Sosa (2004); the items measuring information need were adapted from Ter Huurne and Gutteling (2008) as well as Trumbo (1999); the items measuring information usefulness were adapted from Sussman and Siegel (2003); the items measuring digital library usage for getting information were adapted from Kankanhalli *et al.* (2005) as well as Yan and Davison (2013). In total, 20 graduate students were selected to take part in the pilot survey. According to their feedback, several wordings in some items were adjusted and improved. The complete instrument is presented in Table AI. All the items were measured with seven-point disagree-agree Likert scale (1 represents “strongly disagree” while 7 represents “strongly agree”).

3.2 Data collection

The large-scale survey data collection was conducted in one comprehensive university located in Central China, where there are 31,886 undergraduate students, 16,625 master students, 6,741 doctoral students, 1,577 foreign students and 3,737 full-time faculty members (WHU, 2015). The library of this university is the Central China regional centre of CALIS, having purchased diversified types of digital resources. In the questionnaire, it was first indicated that university digital libraries provide various digital resources to their users. Then a range of digital resources were listed, including some English databases such as SCI, SSCI, Elsevier, Emerald, Springer, IEEE, Wiley and Sage, and some Chinese databases such as CSSCI, China National Knowledge Infrastructure, VIP Chinese Science and Technology Periodicals. After the

questionnaire was published online, potential respondents were invited to visit the online questionnaire. First, drawing on the column of personal profiles on the website of this university's schools and departments, we sent e-mails to potential respondents, inviting them to visit the online questionnaire by clicking the link. Second, some classes were selected and approached, where the potential respondents in the class were invited to scan the two-dimension code of the online questionnaire by using their smart phones to visit the online questionnaire. Third, the potential respondents who entered the university library were invited to scan the two-dimension code of the online questionnaire by using their smart phones to visit the online questionnaire. Data collection was undertaken on a voluntary basis without any extra rewards and the average response rate was approximately 50 per cent. This process lasted for about two months. Consequently, data collected from 381 respondents of this university were used for data analysis. The demographic information of these 381 respondents is documented in Table I.

4. Data analysis and results

In the current study, the partial least squares (PLS) structured equation modelling was employed to verify our measurement and research model. PLS algorithm allows "each indicator to vary in how much it contributes to the composite score of the latent variable", making it "preferable to other techniques" (Chin *et al.*, 2003, p. 197). Specifically, SmartPLS 2.0 was used as an analytical tool (Ringle *et al.*, 2005).

4.1 Measurement model validation

In general, measurement validity was examined in terms of content validity, convergent validity and discriminant validity (Straub *et al.*, 2004). For content validity, it is reasonable to suggest that all the constructs and measure items each have a clear meaning with correct expression given that all of them were adapted from existing research.

Category	Items	Frequency	%
Gender	Male	154	40.42
	Female	227	59.58
Age	< 18	8	2.10
	18-25	330	86.61
	26-35	33	8.66
	36-45	9	2.36
	> 45	1	0.26
Position	Undergraduate	218	57.22
	Masters student	117	30.71
	Doctoral student	36	9.45
	Faculty	10	2.62
Field	Natural sciences	97	25.46
	Social sciences	212	55.64
	Arts and humanities	46	12.07
	Others	26	6.82
Experience with digital libraries (years)	< 1	112	29.40
	1-2	84	22.05
	2-3	55	14.44
	3-4	49	12.86
	> 4	81	21.26

Table I.
Demographic
information of
survey respondents

As presented in Table II, the values of composite reliability and Cronbach's α of each construct are larger than 0.8 (above the recommendation of 0.7), and the values of average variance extracted (AVE) of each construct are larger than 0.7 (above the recommendation of 0.5), which suggests a high degree of reliability and convergent validity of all the constructs (Straub *et al.*, 2004).

The square roots of the AVE of each construct (italic values) is larger than its correlations with other construct as shown in Table III, confirming sufficient discriminant validity (Straub *et al.*, 2004).

Table IV shows the loadings (italic values) and cross-loadings where all items load much higher on their specified constructs than on other constructs, which further suggests sufficient convergent and discriminant validity for all constructs (Straub *et al.*, 2004).

4.2 Common method bias (CMB)

Given that the data collected in this study is self-reported, there might be a possibility that CMB arises. Harman's single-factor test is the most common approach to examine the CMB (Podsakoff *et al.*, 2003). Following Harman's single-factor test, the principal components factor analysis in SPSS was performed. The results showed that the first factor accounts for 20.30 per cent of variance, indicating that the factor does not account for the majority of the variance. Furthermore, following Liang *et al.* (2007), we built a latent common method factor which is reflected by all the constructs' items in the proposed research model. The coefficients of two income paths of each single-item construct were examined. The results showed that each single-item construct is substantially explained by the substantive construct rather than the common method factor (see Table AII). It is thus reasonable to suggest that CMB is not a concern in the current study.

4.3 Structural model with results

The results of the structural model are presented in Figure 3. Informed by the recommendation that the sample size should be larger than 500 (Wetzels *et al.*, 2009),

Constructs	Items	AVE	CR	Cronbach's α
Digital library usage for getting information (DLUSE)	4	0.884	0.968	0.956
Information need (INEED)	3	0.874	0.954	0.928
Information quality (IQ)	3	0.722	0.886	0.811
Information usefulness (IUSEFUL)	3	0.936	0.978	0.966
Reputation (REP)	3	0.791	0.919	0.868
Source credibility (SC)	3	0.885	0.959	0.935

Table II.
Overview of measurement model

	DLUSE	INEED	IQ	IUSEFUL	REP	SC
DLUSE	<i>0.940</i>					
INEED	0.431	<i>0.935</i>				
IQ	0.466	0.487	<i>0.850</i>			
IUSEFUL	0.587	0.560	0.627	<i>0.968</i>		
REP	0.571	0.581	0.696	0.761	<i>0.889</i>	
SC	0.388	0.558	0.741	0.702	0.715	<i>0.941</i>

Note: Diagonal elements are the square root of each construct's AVE

Table III.
Correlations between constructs and square roots of AVE

Table IV.
Loadings and
cross-loadings

	DLUSE	INEED	IQ	IUSEFUL	REP	SC
DLUSE1	0.949	0.420	0.448	0.600	0.572	0.397
DLUSE2	0.955	0.410	0.457	0.553	0.527	0.356
DLUSE3	0.919	0.403	0.432	0.557	0.543	0.388
DLUSE4	0.937	0.383	0.413	0.491	0.500	0.312
INEED1	0.435	0.943	0.458	0.516	0.554	0.502
INEED2	0.365	0.928	0.421	0.499	0.506	0.508
INEED3	0.407	0.934	0.483	0.553	0.567	0.552
IQ1	0.363	0.337	0.784	0.388	0.490	0.481
IQ2	0.384	0.502	0.878	0.637	0.675	0.754
IQ3	0.445	0.372	0.883	0.526	0.577	0.603
IUSEFUL1	0.582	0.553	0.618	0.972	0.759	0.696
IUSEFUL2	0.549	0.545	0.600	0.970	0.719	0.673
IUSEFUL3	0.574	0.528	0.602	0.961	0.730	0.667
REP1	0.572	0.374	0.556	0.525	0.800	0.485
REP2	0.531	0.563	0.647	0.718	0.945	0.647
REP3	0.451	0.583	0.649	0.756	0.917	0.744
SC1	0.374	0.555	0.702	0.667	0.682	0.940
SC2	0.331	0.498	0.698	0.628	0.638	0.931
SC3	0.388	0.520	0.691	0.683	0.697	0.951

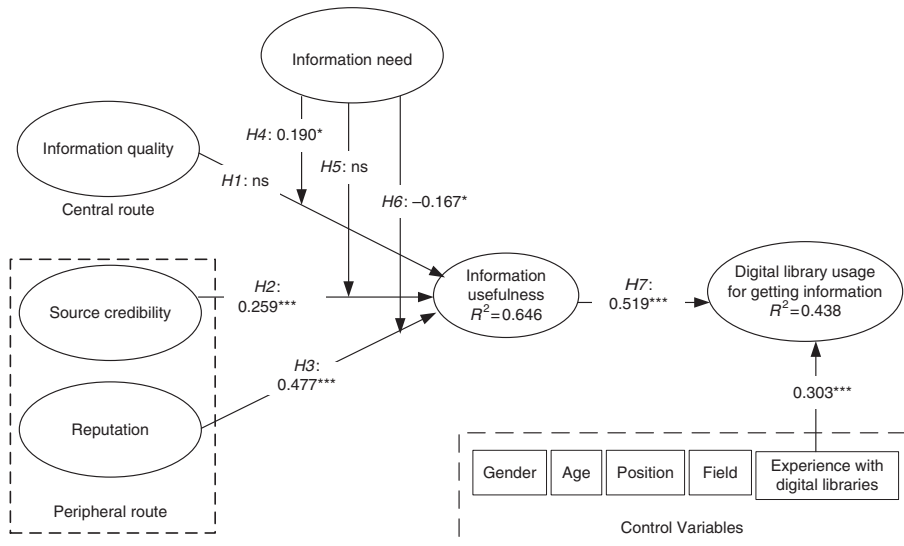


Figure 3.
Research model with
results

Notes: ns, not significant. * $p < 0.1$; *** $p < 0.001$

the bootstrap resampling procedure with 1,000 samples was conducted to assess the path significances. The explained variances of information usefulness and digital library usage for getting information are 0.646 and 0.438, respectively, indicating a good predictive validity of the model (Straub *et al.*, 2004).

Regarding the central route, the effect of information quality on information usefulness is not significant, thus *H1* is not supported. Regarding the peripheral route,

the effect of source credibility on information usefulness is significant with the magnitude being 0.259, thus *H2* is supported. The effect of reputation on information usefulness is significant with the magnitude being 0.477, thus *H3* is supported. Regarding the moderating effects of information need, it positively moderates the impact of information quality on information usefulness with the magnitude being 0.190. Meanwhile, it negatively moderates the impact of reputation on information usefulness with the magnitude being -0.167 , thus *H4* and *H6* are supported. The moderating effect of information need on the impact of source credibility on information usefulness is not significant, thus *H5* is not supported. The effect of information usefulness on digital library usage for getting information is significant with the magnitude being 0.519, thus *H7* is supported.

Control variables (gender, age, position, field and experience with digital libraries) were each linked to digital library usage for getting information when testing the research model so as to eliminate the influences of sample characteristics. The results indicate that experience with digital libraries has a positive effect on digital library usage for getting information, indicating that the users with longer experience with digital libraries are more likely to use digital libraries for getting information. The effects of other control variables are not significant and their paths are thus not shown in Figure 3.

4.4 Post hoc analysis

The correlation between information quality and information usefulness is 0.627 (see Table III), suggesting a great independent effect of information quality on information usefulness. However, from Figure 3, it can be seen that *H1* is not significant. In order to interpret this phenomenon, the results of three regression models are reported in Table V. For Models 1 and 2 where reputation is excluded, information quality has a significant effect on information usefulness. For Model 3 where reputation is included, the effect of information quality on information usefulness is no longer significant. These imply that reputation captures all the information in information quality, thus overpowering the effect of information quality on information usefulness.

5. Discussion and future research

5.1 Discussion and implications

Building on the theory of the ELM, this study develops a research model to explore the antecedents of digital library usage for getting information with information usefulness as a mediator. Information need is treated as a motivation variable to explore the effect of different levels of elaborate likelihood on the impacts of the central and peripheral

Independent variables	Dependent variable Information usefulness		
	Model 1	Model 2	Model 3
Information quality	0.627***	0.238***	ns
Source credibility		0.526***	0.298***
Reputation			0.513***
<i>Model summary</i>			
R^2	0.393	0.518	0.631

Notes: ns, not significant. *** $p < 0.001$

Table V.
Results of three regression models

route on information usefulness. This study usefully contributes to the theoretical development of the structural model exploring the basic process underlying the effectiveness of persuasion to use digital libraries for getting information in the specific context of a Chinese university and beyond more generally.

The ELM provides a general framework for understanding communication-induced attitude change with the consideration of the central and peripheral route. The current study focuses on the context of digital libraries. From Model 2 of Table V, both information quality and source quality have significant effects on information usefulness, concordant with the research by Sussman and Siegel (2003) who drew on the ELM to make predictions about the antecedents of information usefulness in the context of e-mail messages, and with the research by Bhattacharjee and Sanford (2006) who employed the ELM to explore the antecedents of perceived usefulness in the context of document management system. Indeed, information quality and source credibility are two main determinants of information usefulness.

From Model 3 of Table V, the effect of information quality on information usefulness is overpowered by reputation which reflects the degree to which people believe that digital libraries are known. This result suggests that when reputation is considered, the effect of information quality on information usefulness would disappear. Meanwhile, reputation has the largest effect on information usefulness. This means low reputation would most lead to low perception of information usefulness whereas high reputation would most lead to high perception of information usefulness. We thus recommend that digital libraries should enhance own reputation via various ways such as introducing the characteristics and usefulness of purchased academic databases through propaganda techniques, organizing various user training activities or even integrating into users' environments by embedded service.

Information need reflects the gap between the current information owned by individuals and an information sufficiency threshold, describing the amount of information they further need for handling a given task (Lu and Yuan, 2011). Information need is a motivation variable. Like other motivation variables such as need for cognition (Cacioppo *et al.*, 1983), involvement (Sussman and Siegel, 2003) and job relevance (Bhattacharjee and Sanford, 2006), information need increases elaboration likelihood. From Figure 3, information need positively moderates the effect of information quality on information usefulness, concordant with the ELM and with many prior studies such as by Cacioppo *et al.* (1983), Sussman and Siegel (2003) and Bhattacharjee and Sanford (2006). This means the effect of information quality on information usefulness will be stronger for individuals with high information need. In the current study, information need is placed in the context of the task in study/work. Generally, digital libraries relate more to study and work (Yan and Zha, 2014). It is thus reasonable to suggest that information need for the task in study/work is more likely to motivate individuals to select digital libraries as information sources. For the group of users with high information need, their elaboration likelihood is at the high end. In this case, they would carefully and thoughtfully consider the true merits of the information provided by digital libraries. This would be in favour of digital libraries given the information quality of digital libraries is suggested to be higher than that of social media (Yan *et al.*, 2014). In other words, digital libraries would more easily attract the users with high information need.

Like other peripheral factors, reputation reflects nothing about the information *per se*. From Figure 3, information need negatively moderates the effect of reputation on information usefulness, concordant with the ELM and with prior research such as by

Petty *et al.* (1983) and Gregory *et al.* (2013). This means reputation will stand out as a much stronger determinant for individuals with low information need. For the group of users with low information need, their elaboration likelihood is at the low end. In this case, individuals are less likely to “relate the incoming information to their prior knowledge in an effort to evaluate the merits of the information”. Instead, they would be more likely to use simple cues and superficial analyses to judge the validity of the information provided (Cacioppo and Petty, 1984, p. 673). To some extent, low information need essentially refracts the lack of information literacy given recognizing when information is needed and what kind of information is needed is critical for information literacy (Usluel, 2007). We thus recommend that digital libraries should actively interact with users so as to understand the exact nature of their information need. Librarians should especially pay attention to the users who have low information need for the task in study/work and try various ways to cultivate their information need. When more and more users have high information need, the high quality of the information provided by digital libraries would be much appreciated. Perceptions of high information quality would lead to high information usefulness which further leads to frequent usage of digital libraries for getting information, with the result that the final aim of digital libraries would be achieved.

5.2 Limitations and future research

This study has several limitations. First, this study only explored the causal effects of gender, age, position, field and experience with digital libraries on digital library usage for getting information, future research employing the statistical method such as independent samples *t*-test and one-way analysis of variance to explore the exact mean difference among user groups is invited. Second, social media have emerged and evolved substantially, having become important information sources for users (Kaplan and Haenlein 2010). It is virtually impossible to ignore the information behaviour in social media (Ross and Sennyey, 2008). The current study focuses on the context of digital libraries. Future research is needed to employ the ELM to the context of social media and make a comparison between these two contexts of information sources. Third, the data collection of this study was conducted in one comprehensive university located in Central China. The library of this university is the Central China regional centre of CALIS with diversified types of domestic and foreign digital resources, representing a typical population context. However, the generalization of the findings of this context needs further investigation in other Chinese universities and other countries.

6. Conclusion

Building on the ELM, the current study explores the effects of the central route (information quality) and the peripheral route (source credibility and reputation) on information usefulness which further impacts digital library usage for getting information. Information need positively moderates the effect of information quality on information usefulness and negatively moderates the effect of reputation on information usefulness. Digital libraries enormously influence the way how individuals gather information over the world (Liu and Luo, 2011). However, the important status of digital libraries as conventional information sources in practice invites appreciation by more and more people. This study can usefully help managers and librarians of digital libraries recognize the role of information need and thus try various ways to

cultivate the information need of users especially the users with low information need. When more and more users have high information need, they would frequently use and spend a lot of time using digital libraries for getting information, which would pave the way for the final aim of digital libraries to be achieved.

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Constructs	Definitions	Items
Information quality (adapted from Bhattacharjee and Sanford, 2006)	The quality of outputs digital libraries produce, concerning completeness, accuracy and currency	<ol style="list-style-type: none"> 1. The information in the digital library of my university is up to date 2. The information in the digital library of my university is accurate 3. The information in the digital library of my university is comprehensive
Source credibility (adapted from Bhattacharjee and Sanford, 2006)	The credibility of the persons who generate information in digital libraries	<ol style="list-style-type: none"> 1. The persons generating information in the digital library of my university are trustworthy 2. The persons generating information in the digital library of my university are knowledgeable 3. The persons generating information in the digital library of my university are credible
Reputation (adapted from Koufaris and Hampton-Sosa, 2004)	The degree to which people believe in digital libraries' honesty towards their users and the degree to which people believe that digital libraries are known	<ol style="list-style-type: none"> 1. The digital library of my university is well known 2. The digital library of my university has a good reputation 3. The digital library of my university has a reputation for being honest
Information usefulness (adapted from Sussman and Siegel, 2003)	The degree to which users believes that the information in digital libraries can have a positive impact on their study/work	<ol style="list-style-type: none"> 1. The information in the digital library of my university is valuable for my study/work 2. The information in the digital library of my university is informative for my study/work 3. The information in the digital library of my university is helpful for my study/work
Information need (Adapted from Ter Huurne and Gutteling, 2008; Trumbo, 1999)	Users' need for information about the task in their study/work	<ol style="list-style-type: none"> 1. I require a lot of information to carry out the task in my study/work 2. I require a lot of information to know everything about the task in my study/work 3. A great deal of information is required to make a judgment about the task in my study/work

Table A1.
Constructs and items

(continued)

Table AI.

Constructs	Definitions	Items
Digital library usage for getting information (adapted from Kankanhalli <i>et al.</i> , 2005; Yan and Davison, 2013)	The actual information getting behaviour in digital libraries in respect to the frequency and the amount of time involved	<ol style="list-style-type: none"> 1. I often use my university digital library to get information in my study/work 2. I frequently use my university digital library to get information in my study/work 3. I regularly use my university digital library to get information in my study/work 4. I spend a lot of time using my university digital library to get information in my study/work

Constructs	Items	Substantive path coefficients	Method path coefficients
DLUSE	DLUSE1	0.902***	0.060*
	DLUSE2	0.963***	-0.012
	DLUSE3	0.892***	0.037
	DLUSE4	1.003***	-0.086**
INEED	INEED1	0.944***	0.001
	INEED2	0.975***	-0.060*
	INEED3	0.887***	0.059*
IQ	IQ1	1.007***	-0.228***
	IQ2	0.626***	0.270***
	IQ3	0.935***	-0.057
IUSEFUL	IUSEFUL1	0.924***	0.055*
	IUSEFUL2	1.015***	-0.051*
	IUSEFUL3	0.965***	-0.005
REP	REP1	0.980***	-0.179*
	REP2	0.953***	-0.013
	REP3	0.753***	0.170**
SC	SC1	0.904***	0.043
	SC2	0.993***	-0.072*
	SC3	0.927***	0.028

Table AII.
Common method bias analysis in PLS

Notes: * $p < 0.1$; ** $p < 0.01$; *** $p < 0.001$

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