Comparison between user affinity with digital libraries and virtual communities

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ABSTRACT. *There is ongoing discussion about the value and reliability of information produced by experts and organized by digital libraries in universities versus information produced by the crowd in virtual communities. This study compares users' perceptions of digital libraries and virtual communities in terms of affinity. In this study, affinity with digital libraries or virtual communities is defined as the degree of importance that users place on digital libraries or virtual communities. Data collected from 334 users of digital libraries and virtual communities were used for data analysis. The statistical method of 'compare means' is employed. We find the mean of affinity with digital libraries is significantly larger than that of virtual communities, suggesting users are likely to perceive higher levels of affinity with digital libraries than with virtual communities. More analysis oriented to different groups is also conducted. The findings and their implications are discussed.*

Introduction

A digital library is a distributed system that has the capability to store various electronic resources, which can be easily and conveniently accessed by remote end users via networks[1]. As the logical extension of physical libraries in the modern information society, a digital library is a "collection of information that has associated services delivered to user communities using a variety of technologies"[2, p. 269]. During the last 30 years, digital libraries have gone from a curiosity to mainstream[3]. In China, digital libraries in universities have achieved substantial development since the Ministry of Education (MOE) initiated the China Academic Library and Information System (CALIS) in 1998. CALIS provides the ultimate support for information users through its four national information centers, namely: Science, Social Science and Humanities Information Center; Engineering and Technology Information Center; Medical Information Center; and Agricultural Information Center. Its one important aim is "to introduce and produce various databases"[4, p. 400]. All academic libraries and other social information service organizations in China could apply to join CALIS and enjoy all the services CALIS provides, such as dissertation

database building, imported resource consortia acquisitions, online cataloguing, interlibrary loan (ILL) and document delivery (DD)[5]. CALIS now has more than 1000 member libraries[6]. Given the insufficient funding of libraries, ILL and DD services have received much attention. The CALIS ILL/DD service network was created in June 2004. With this service network, about 60 large academic libraries could provide lending services to other member libraries[7].

Virtual communities refer to "online social networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions" [8, p. 1873]. Virtual communities are suggested to provide informal yet useful platforms for knowledge sharing activity[9]. Indeed, virtual communities show much promise in "promoting communication, collaborative authoring, and information sharing" [10, p. 582]. Students have positive attitudes towards academic use of social networking sites[11]. Consequently, virtual communities have increasingly influenced users' information-seeking behavior[12, 13]. And it is actually impossible to ignore the information behavior and collective wisdom in virtual communities[14].

The purpose of using digital libraries and virtual communities might be different. Digital libraries seem to relate to more of study and work while virtual communities seem to relate to more of leisure and society in addition to study and work. This study would not examine the purpose of using digital libraries and virtual communities by users. Instead, this study examines affinity in terms of information sources. We suggest both formal digital libraries and informal virtual communities can potentially be important information sources in the modern information society. However, "building and retaining the loyalty of library customers in the Web environment poses new challenges for libraries" [15, p. 184]. Most users who enter the library are not using library resources or services. Instead, "they are buying coffee in our cafes, reading e-mail on our terminals, socializing with friends, or using group studies" [14, p. 146]. In this situation, we suggest affinity, which was defined as the degree of importance that users place on information sources[16, 17], can be used to measure the exact nature of importance that users place on digital libraries and virtual communities. This study explores and compares users' perceptions of digital libraries and virtual communities in terms of affinity, which we think provides a new view for digital library research and practice alike.

Affinity

Affinity is conceptualized as the perceived importance of the medium in an individual's life [16]. For example, Perse[16] suggests that higher levels of affinity are significantly associated with higher levels of duration of soap opera viewing. Aldás-Manzano, Ruiz-Mafé and Sanz-Blas[18] suggest that affinity with mobile telephones has a direct and positive influence on the intention to engage in mobile shopping. Ruiz-Mafe and Sanz-Blas[17] suggest that affinity with the Internet significantly influences Internet dependency. Other studies have examined affinity and its impact on the selection and use of various media and contents, taking as their focus the online auctions[19], music [20], YouTube[21] and virtual worlds [22]. However, the comparison between digital libraries and virtual communities in terms of affinity has been largely overlooked in the literature.

In this study, affinity with digital libraries or virtual communities is defined as the degree of importance that users place on digital libraries or virtual communities[16, 17]. It represents an attitude developed from past experience with digital libraries or virtual communities[16, 22]. It reflects the closeness of an individual's connection to and relationship with digital libraries or virtual

2

communities[23]. It reflects the degree to which an individual looks forward to being involved in digital libraries or virtual communities[24].

Method and data collection

We investigate two constructs (latent variables) in our study, namely: affinity with virtual communities and affinity with digital libraries. These two constructs and their corresponding measures were adapted from the previous literature to fit the context of this study. Specifically, the items measuring affinity were adapted from the article by Aldás-Manzano et al.[18]

After the instrument was developed, 20 graduate students were selected for the pilot survey. Based on their feedback and our experience in administering the pilot survey, we adjusted wordings in several items. The complete instrument can be found in the Appendix. All items were measured with a 7-point disagree-agree Likert scale (1 represents "strongly disagree" and 7 represents "strongly agree"). Then a large scale survey was conducted.

The large scale survey data collection lasted for 5 weeks through an online survey website. In the survey questionnaire, we first described digital libraries and listed some Chinese databases such as Wanfang Digital Periodicals and China National Knowledge Infrastructure (CNKI), and some English abstract databases such as SCI, SSCI, as well as some English full-text databases published by Wiley, Emerald, Elsevier, Springer and Sage. Meanwhile, we described virtual communities and listed some of them such as Baidu Know, Baidu Document, Sina Microblog, ScienceNet Blog, Chinese Wikipedia. After publishing the questionnaire online, we randomly invited library users of ten universities in China who are also users of virtual communities through email or instant messaging to visit our online questionnaire where the purpose of this study was explained and their participation was solicited. Consequently, data collected from 334 users were used for data analysis for this study after deleting the invalid responses (the responses with 4 being chosen across all the items were deleted; based on the amount of time recorded by the online survey website for each respondent, the responses finished within a short time were deleted). Table 1 documents the demographic information of these 334 respondents.

Table 1. Demographic information of respondents

Category	Item	Frequency	Percent
Gender	Male	159	48
	Female	175	52
Age	18-25	235	70
	26-35	72	22
	36-45	21	6
	46-55	6	2
	>55	0	0
Position	Undergraduate	136	41
	Master student	106	32
	Doctoral student	41	12
	Faculty	51	15
Field	Natural Sciences	101	30.2

	Social Sciences	151	45
	Arts and Humanities	46	14
	Others	36	11
Your experience with virtual communities (year)	<1	86	26
	1-2	44	13
	2-3	49	15
	3-4	48	14
	>4	107	32
Your experience with digital libraries (year)	<1	57	17
	1-2	77	23
	2-3	55	17
	3-4	40	12
	>4	105	31
Which information source you used first	Digital libraries	179	54
	Virtual communities	155	46

Data analysis and results

This study examines the following specific research questions: do users perceive higher levels of affinity with digital libraries or virtual communities? For users from different groups, do they perceive higher levels of affinity with digital libraries or virtual communities?

Measurement model validation

Prior to data analysis, we first assessed measurement validity. The measurement validity was assessed through content validity, convergent validity and discriminant validity[25]. With regard to content validity, since all the constructs and items in this study are based on the previous literature, we thus believe these constructs and items each have clear and correct meaning.

The left section of Table 2 shows the results of AVE (Average Variance Extracted), CR (Composite Reliability) and Cronbach's Alpha. Convergent validity was assessed with Cronbach's Alpha and CR, and can be established with a score greater than 0.7 [25]. From Table 2, it can be seen that the smaller value of CR is 0.906 and the smaller value of Cronbach's Alpha is 0.844, which suggests higher convergent validity and reliability of these two constructs. The right section of Table 2 is the correlation between these two constructs and the square root of each construct's AVE. Discriminant validity was established since the square root of each construct's AVE (bold values) is larger than its correlations with other constructs [25].

Table 2. Overview of measurement model

Constructs	Items	AVE	CR	Cronbach's Alpha	AFFDL	AFFVC
Affinity with digital libraries (AFFDL)	3	0.797	0.922	0.872	**0.893**	
Affinity with virtual communities (AFFVC)	3	0.764	0.906	0.844	0.057	**0.874**

Due to the measurement validity, we thus believe it is appropriate to use these data for further analysis. The score of the two constructs this study examines was each calculated based on their measurement models.

Comparing means

We used the statistical method of 'compare means', namely, the paired samples t test for dependent samples, for the data analysis of this study. Table 3 shows the result which suggests that there is significant mean difference between affinity with virtual communities and digital libraries (bold values in tables 3 to 7 indicate that the corresponding mean difference is statistically significant). Specifically, the mean of affinity with digital libraries is 4.264 while the mean of affinity with virtual communities is 3.947. The mean difference is 0.317.

Table 3. Paired samples t test for the whole sample

	Mean	N	Standard deviation	Paired mean difference	t	Significance (2-tailed)
AFFDL	4.264	334	1.454	0.317	2.866	**.004**[**]
AFFVC	3.947	334	1.483			

[*]$p<0.05$; [**]$p<0.01$; [***]$p<0.001$

Given the fact that individual differences determine how individuals think and behave in different ways[26], we thus conduct further analysis oriented to different groups. We examined the roles of gender, field, position and which source is used first. We split the sample to different groups according to these roles and conducted paired samples t test for them separately.

Table 4 shows the result of paired samples t test for different groups in terms of gender. We can see that for the male group, they are likely to perceive higher levels of affinity with digital libraries. The mean difference is 0.360. For the female group, the difference between affinity with digital libraries and virtual communities is not significant.

Table 4. Paired samples t test for different groups in terms of gender

		Mean	N	Standard deviation	Paired mean differences	t	Significance (2-tailed)
Male	AFFDL	4.200	159	1.522	0.360	2.210	**0.029**[*]
	AFFVC	3.840	159	1.504			
Female	AFFDL	4.322	175	1.391	0.277	1.842	0.067
	AFFVC	4.045	175	1.461			

[*]$p<0.05$; [**]$p<0.01$; [***]$p<0.001$

Table 5 shows the result of paired samples t test for different groups in terms of field. We can see that there are no significant differences except for social sciences where users are likely to perceive higher levels of affinity with digital libraries and the mean difference is 0.420.

Table 5. Paired samples t test for different groups in terms of field

		Mean	N	Standard deviation	Paired mean differences	t	Significance (2-tailed)
Natural Sciences	AFFDL	4.030	101	1.547	0.259	1.149	0.253
	AFFVC	3.771	101	1.420			
Social Sciences	AFFDL	4.428	151	1.412	0.420	2.887	**0.004** **
	AFFVC	4.008	151	1.445			
Arts and Humanities	AFFDL	4.171	46	1.409	0.169	0.548	0.587
	AFFVC	4.002	46	1.609			
Others	AFFDL	4.349	36	1.370	0.231	0.643	0.524
	AFFVC	4.118	36	1.656			

*p<0.05; **p<0.01; ***p<0.001

Table 6 shows the result of paired samples t test for different groups in terms of position. We can see that undergraduate students are likely to perceive higher levels of affinity with virtual communities and the mean difference is -0.335. For master students, the difference is not significant. For both doctoral students and faculty, they are likely to perceive higher levels of affinity with digital libraries. The mean difference is 1.722 for doctoral students and 1.058 for faculty.

Table 6. Paired samples t test for different groups in terms of position

		Mean	N	Standard deviation	Paired mean differences	t	Significance (2-tailed)
Undergraduate	AFFDL	3.604	136	1.303	-0.335	-2.132	**0.035***
	AFFVC	3.939	136	1.455			
Master student	AFFDL	4.314	106	1.309	0.253	1.400	0.164
	AFFVC	4.061	106	1.429			
Doctoral student	AFFDL	5.546	41	1.304	1.722	5.525	**0.000***
	AFFVC	3.824	41	1.597			
Faculty	AFFDL	4.890	51	1.263	1.058	3.689	**0.001** **
	AFFVC	3.832	51	1.596			

*p<0.05; **p<0.01; ***p<0.001

Table 7 shows the result of paired samples t test for different groups in terms of which source is first used. We can see that for users, who used digital libraries first, they are likely to perceive higher levels of affinity with digital libraries and the mean difference is 1.271. For users, who used virtual communities first, they are likely to perceive higher levels of affinity with virtual communities and the mean difference is -0.787.

Table 7. Paired samples t test for different groups in terms of which source is first used

		Mean	N	Standard deviation	Paired mean differences	t	Significance (2-tailed)
Digital libraries	AFFDL	4.761	179	1.350	1.271	9.695	**0.000*****
	AFFVC	3.490	179	1.491			
Virtual communities	AFFDL	3.689	155	1.357	-0.787	-5.693	**0.000*****
	AFFVC	4.476	155	1.288			

*p<0.05; **p<0.01; ***p<0.001

Discussion and implications

It is suggested that "libraries are no longer islands of information, but one among many nodes through which information flows to the users"[14, p. 146]. In this study, we compare users' perceptions of digital libraries and virtual communities in terms of affinity. Specifically, Table 3 presents the exact nature of the mean difference between users' perceptions of affinity with digital libraries and affinity with virtual communities, treating the sample as one whole. Tables 4 to 7 presents users' perceptions of affinity oriented to different groups. We believe the findings of this study have important implications.

The results in Table 3 are oriented to the whole sample. It can be seen that the mean difference is statistically significant. The mean of affinity with digital libraries is larger than that of affinity with virtual communities. We suggest this result can to some extent indicate that virtual communities are playing the role as a complement rather than a substitute to digital libraries. We suggest this might attribute to the positive effect of CALIS on the development of digital libraries in China where many services such as imported resource consortia acquisitions and ILL/DD can be enjoyed by all the member libraries of CALIS [7].

The results in Table 4 suggest that female users don't perceive any differences regarding the importance of digital libraries and virtual communities. The results in Table 5 suggest that users in social sciences perceive higher levels of affinity with digital libraries. The reasons for these findings need further investigation. The results in Table 6 suggest that doctoral students and faculty perceive higher levels of affinity with digital libraries while undergraduate students perceive higher levels of affinity with virtual communities. We think this is consistent with the prior study which shows that only 42% of undergraduate students access a scholarly database at least once in the course of the entire semester[27] and with the phenomenon in practice where doctoral students and faculty tend to rely more on digital libraries to conduct academic researches.

We suggest the results in Table 7 can be explained by the effect of first impressions. As a psychological phenomenon, the effect of first impressions is suggested to be an anchoring effect[28]. Based on the adaptation level theory, the perception of a new experience or cognition is suggested to be a shift from individuals' prior baseline or reference levels. The new experience or cognition is likely to remain close to the prior cognitions[29]. Therefore, initial perceptions of the importance of digital libraries or virtual communities serve as an anchor for later evaluations. As we can see in Table 7, users who used digital libraries first are likely to perceive higher levels of affinity with digital libraries whereas users who used virtual communities first are likely to perceive higher levels of affinity with virtual communities. We suggest this brings a challenge for the librarians in university libraries. It is reported that the information seeking habits of library users is well

formed before they arrive on campus[14]. This means more and more users would be likely to use virtual communities first before they have opportunities to use university digital libraries. According to the findings above, users who used virtual communities first would be likely to perceive higher levels of affinity with virtual communities. We suggest this finding should be paid much attention by librarians in university libraries who need to introduce users especially freshmen to the useful functionality of digital libraries. Only with the help of librarians, can these users be led to appreciate the importance of digital libraries and further benefit from using digital libraries.

There are many challenges in the management of digital libraries[30]. On one hand, "students may have misconceptions about library resources" due to their "affective and perceptual biases towards certain types of sources"[31, p. 179]. On the other hand, "in the fast, ever-changing world of electronic resources, the question remains about whether librarians can and need to catalog the entire Internet and if they can satisfy their patrons in this way" [28, p. 97]. Based on the findings of this study that users generally perceive higher levels of affinity with digital libraries, we suggest librarians needn't concern themselves with the challenge brought by virtual communities. As a matter of fact, digital libraries "function differently from business entities"[15, p. 184], with the aim of managing the migration to digital information services[32]. Furthermore, librarians should learn to appreciate virtual communities whose quality, reliability and knowledge value have been increasingly acknowledged [12, 33]. They should hold the belief that the usage of both digital libraries and virtual communities can potentially inform each other. Only in this way, can the real meaning of digital library initiatives be signified and the importance of digital libraries be highlighted.

Conclusion

Given the competition faced by digital libraries in the modern information society[14], the aim of this study is to explore and compare users' perceptions of digital libraries and virtual communities in terms of affinity so as to understand the exact nature of importance that users place on digital libraries and virtual communities. We find users generally perceive higher levels of affinity with digital libraries than virtual communities. We believe the findings of this study provide useful insights into the issue regarding the importance of different information sources. Given the complexity of information sources and human information behaviors, we suggest that further qualitative study is needed. We believe this further study would present richer qualitative data regarding the findings of this study. Moreover, even though digital libraries seem to relate to more of study and work while virtual communities seem to relate to more of leisure and social interaction, we suggest the purpose of using digital libraries and virtual communities keeps on changing. For digital libraries, librarians "will need to employ more engaging and active methods to reach their patrons" through the use of Web 2.0 applications which emphasizes users and their participation [34, p.264]. This would probably add more elements to digital libraries in addition to study and work. For virtual communities, it was suggested that "the epistemic consequences of people using Wikipedia as a source of information are likely to be quite good" and the knowledge value and reliability of user generated Wikipedia compares favorably to the knowledge value and reliability of traditional encyclopedias produced by experts[12, p. 1662]. Using social network sites is not just for fun[35]. We thus suggest further study regarding the purpose of using different information sources by users is needed. We believe this further study would present more evidence

regarding the exact nature of the purpose of using digital libraries and virtual communities, thus usefully complementing the study presented here.

Acknowledgements

Appendix: The questionnaire

University digital libraries provide various electronic resources for users. For example, English electronic resources include SCI, SSCI, as well as some English full-text databases published by Wiley, Emerald, Elsevier, Springer, Sage, etc. Chinese electronic resources include CSSCI, China National Knowledge Infrastructure (CNKI), Wanfang Digital Periodicals, etc. Virtual communities refer to online social networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions. With the development of Web 2.0，various virtual communities whose contents are created by the crowd, such as Baidu Know, Baidu Document, Sina Microblog, ScienceNet Blog, Chinese Wikipedia, have become important and free information sources. This survey will be only used for research. Thanks for your participation and support!

Basic information
(1) Gender
　□Male　　　　　□Female
(2) Your age
　□ 18-25　　□ 26-35　　□ 36-45　　□ 46-55　　□ >55
(3) Your current position
　□Undergraduate　　□Master student　　□Doctoral student　　□Faculty
(4) Your field
　　□Natural Sciences　　□Social Sciences　　□Arts and Humanities　　□Others
(5) Your experience with university digital libraries (year)
　　□<1　　□1-2　　□2-3　　□3-4　　□>4
(6) Your experience with virtual communities (year)
　　□<1　　　□1-2　　　□2-3　　　□3-4　　　□>4
(7) Which information source you used first
　　□Digital libraries　　□Virtual communities

For each of the following statements, please answer according to your own beliefs and knowledge. Please note that there are no right or wrong answers to any of the questions. Please answer all questions if possible. If you are not sure exactly how to answer, please provide your best and most accurate judgment. You can respond by selecting one of the numbers 1, 2, 3, 4, 5, 6 or 7 according to your judgment under each statement. Many thanks!

Affinity with virtual communities (Strongly disagree (1) ~ Strongly agree (7)**)**
1. Seeking information in virtual communities is one of my main daily activities.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. Virtual communities are important in my life.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

3. I cannot go for several days without seeking information in virtual communities.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Affinity with digital libraries (Strongly disagree (1) ~ Strongly agree (7))
1. Seeking information in the digital library of my university is one of my main daily activities.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. The digital library of my university is important in my life.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

3. I cannot go for several days without seeking information in the digital library of my university.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

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