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Exploring the effect of individual differences on user perceptions

of print and electronic resources

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Abstract

Purpose –Individual differences are critical in determining how individuals think and behave in different ways. The purpose of this study is to explore the effect of individual differences on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage in the hopes that a better understanding of these effects can help Chinese university libraries to meet the diversified information needs of their users more specifically and appropriately so that the second-level capability divide and third-level outcome divide of library information resources can be much reduced.

Design/methodology/approach – Data collected from 273 library users were used for data analysis. The independent samples t test, one-way analysis of variance (ANOVA) and two-way ANOVA were employed. Meanwhile, the quantitative analysis is supplemented by the qualitative interviews which present richer data about the use of specific types of print and electronic resources.

Findings – The effect of basic characteristics (gender, age, field) and experience (experience with library print resources, experience with library electronic resources, which library resources were used first) on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage was explored and discussed. Meanwhile, the two-way interaction effect was examined and 13 significant interaction effects were presented.

Originality/value –Building on the digital divide, this study examines ease of use, usefulness and usage in terms of individual differences which cover not only basic characteristics but also experience and two-way interaction, which we think provides a new view for library information resources research and practice alike in China.

Keywords Print resources, Electronic resources, Ease of use, Usefulness, Usage, Individual differences, Chinese university libraries

Paper type Research paper

1. Introduction

The aim of university libraries is to provide academic information and services for learning,

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teaching and scientific research. Recently, the proliferation of information resources in both print and electronic formats has been seen in Chinese university libraries. Print resources represent traditional information resources, such as print books and print journals. Electronic resource "is a deceptively simple and generic term that can encompass anything from a PDF of a government report to an aggregated database" (Skaggs *et al.*, 2006, p.192). Any interactive website, system or tool that can support users in finding and using electronic information can be regarded as an electronic resource (Makri *et al.*, 2011). With the development of digital libraries over the last three decades (Arms, 2012), university libraries can provide their users with the access to a diversity of electronic resources which usefully complement print collections and have become important tools for research and study (Gutierrez and Wang, 2001; Noh, 2012). In China, since 1998 when China Academic Library and Information System (CALIS) was initiated, more than 1000 member libraries have participated in the project construction of CALIS, which has greatly improved online document and information services for library users (Yao and Zeng, 2012).

Previous studies focused on the usage of print and/or electronic resources (Falk, 2003; Tenopir et al., 2009; Tenopir and King, 2002) as well as users' information retrieval behavior in the case of both formats (Berg et al., 2010). Groote (2008) suggested that print journals may continue to be widely used even after the introduction of electronic journals. Dadzie (2005) investigated the use of electronic resources by students and faculty at the Ashesi University to examine the level of use, the type of information accessed and the effectiveness of the library's communication tools for information research, and found that the usage of some internet resources was very high whereas the use of scholarly databases was quite low, which might attribute to the inadequate information about the existence of these library resources. Ibrahim (2004) proved that e-books, bibliographic databases and e-journals were at a very low level of usage by faculty members at the United Arab Emirates University, which might relate to the lack of awareness about the e-resources provided by the library or the ineffective channels of communication in campus. Zha et al. (2013) compared Chinese electronic resources and English electronic resources in terms of ease of use, usefulness and usage. They argued that there are more users who perceived that Chinese electronic resources are both easy to use and useful, and that there are more users who used Chinese electronic resources more frequently. Yan et al. (2013) compared electronic resources inside and outside the library in terms of ease of use, usefulness and usage, and suggested that unconventional electronic resources outside the library are playing a role as a complement rather than a substitute to the conventional electronic resources inside the library. The two-year research project (Stanford University Libraries, 2010) conducted by Stanford University Libraries indicated that over 75% of the respondents preferred e-journals to their printed counterparts to retrieve full-text articles. However, as for the effect of users' individual differences especially their experience with print and electronic resources on their perceptions of print and electronic resources, it has been largely overlooked in the literature.

Individual differences are critical in determining how individuals think and behave in different ways (Nov and Ye, 2008). In this study, individual differences cover not only basic characteristics (gender, age, field), but also experience (experience with library print resources, experience with library electronic resources, which library resources were used first) and two-way interaction. Building on the digital divide, this study explores the exact nature of users' perceptions of print and electronic resources in terms of individual differences, which we think provides a new view for library information resources research and practice alike in China. We

suggest a better understanding of the effect of individual differences on users' perceptions of print and electronic resources in terms of ease of use, usefulness and use can help Chinese university libraries to recognize and meet the diversified information needs of their users more specifically and appropriately so that the second-level capability divide and third-level outcome divide of library information resources can be much reduced.

Following this introduction, we review the literature, paying attention to ease of use, usefulness and usage of print and electronic resources, and then propose the research questions. We follow these with a description of the research methodology and data collection. Then, we present the results of the research and a discussion of these results.

2. Literature review

2.1 Digital divide



For the utilization of information resources, there are three levels of digital divide (Wei et al., 2011). The first-level digital divide is the access divide referring to the inequality of access to information resources, which has greatly been reduced in China due to the initiative of CALIS. The second-level digital divide is the capability divide which refers to the inequality of the capability to exploit information resources. The third-level digital divide is the outcome divide which refers to the inequality of outcomes (e.g., learning and productivity) of exploiting information resources (Wei et al., 2011). We suggest that, to some extent, the second-level capability divide can be reflected by the degree of ease of use perceived by users while the third-level outcome divide can be reflected by the degree of usefulness perceived by users. In this study, ease of use is a construct (latent variable) which refers to users' perceptions concerning the amount of effort required to use library resources such as electronic resources or print resources (Venkatesh et al., 2003). The construct usefulness refers to users' perceptions concerning the degree to which using library resources such as electronic resources or print resources would improve performance (Venkatesh et al., 2003). The construct use refers to the actual usage of library resources such as electronic resources or print resources with respect to the frequency of use and the amount of time involved (Venkatesh et al., 2003; Zha et al., 2013). Consequently, digital divide provides theoretical support for this study.

2.2 Ease of use of print and electronic resources

Ease of use of library resources has been extensively accepted as a critical factor to determine patrons usage behavior. Investigations of ease of use of both print and electronic resources have been previously reported in the literature. Sathe *et al.* (2002) examined how patrons used print and electronic resources differently. The results revealed that faculty preferred print journals over electronic ones, whereas most residents and fellows preferred electronic journals. Specifically, ease of access, ease of printing and ease of searching were common reasons for preferring electronic journals while being easier to read with better graphic quality, easier to browse and easier to access were the most-cited reasons for preferring print format. Stewart (2000) pointed out that electronic resources were easier to use for several reasons such as robust searching capability, speed, convenience and completeness; meanwhile, print resources can be immediately accessible without being subject to information technology (IT) involvement and the limitation of equipment (software, hardware, etc.). Berg *et al.* (2010) indicated that undergraduate students with higher

computer literacy used print books more effectively compared with e-books. Siebenberg *et al.* (2004) conducted a survey at Washington State University and suggested that databases made it easier to find older articles and references from office and home computers. Maynard and O'Brien (2010) indicated that the lack of availability of print materials in the library was a barrier for the respondents to choose content for their teaching materials.

2.3 Usefulness of print and electronic resources

Usefulness is considered to be an important dimension for the choice of different kinds of library resources. Previous studies have investigated usefulness of both print and electronic resources. An investigation conducted by Mulligan and Mabe (2011) suggested that a clear advantage of the electronic form over print form of the research article was its ability to publish and provide access to the supplementary data such as tables, images and videos that formed part of the original research. Stewart (2000) indicated that electronic resources were more useful for their ability to link to other sources including multimedia elements and many subject fields, meanwhile, print resources were viewed as an archival format and were seen as a heritage and a wealth. The relevance between users' tasks and information resources determined users' perceptions of usefulness of the resources (Park et al., 2009). Kim (2010) found that as the relevance of university library website resources to users' tasks increases, so does their motivation to use the resources. Specifically, the doctoral student/faculty group were more likely to perceive the usefulness of university library website resources than the undergraduate student group and master student group. Tenopir et al. (2004) indicated that medical professionals mainly relied on traditional print resources for most of their readings due to the usefulness of the information obtained from what they had read.

2.4 Usage of print and electronic resources

The status of usage of library resources has been reported by previous studies. Sampath Kumar and Kumar (2010) found that even though a majority of the academics used electronic information sources for their academic-related works, most of them preferred print to electronic information sources in India. Mawindo and Hoskins (2008) evaluated students' use of print and electronic resources at the University of Malawi College of Medicine and found that students used both print and electronic resources, relatively, print resources were more heavily used than electronic ones. Agboola (2010) conducted a two-part questionnaire to study the use of print and electronic resources by agricultural science students in Nigerian universities and found that students had a stronger preference for electronic resources. Dilevko and Gottlieb (2002) indicated that while undergraduates began researching tasks (e.g., assignments and essays) with the usage of electronic resources, print resources were still vital components because of their completeness, accuracy, permanent accessibility and in-depth nature. A survey conducted by Liu (2006) revealed that graduate students in a metropolitan university setting seemed to expect a hybrid of print and electronic resources which provided users with more access choice between the two formats. Dilek-Kayaoglu (2008) revealed that most researchers supported the transition from print to electronic format. Berg et al. (2010) observed the usage of e-books compared with print books by undergraduates and indicated that users continued to prefer print books to e-books. Tenopir et al. (2004) found that medical faculty continued to rely on print journals versus electronic ones.

3. Research questions

Prior studies have extensively examined ease of use, usefulness and usage of print and electronic resources. However, the effect of individual differences, especially the effect of experience and two-way interaction on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage has been largely overlooked in the literature, inviting more research. Building on the digital divide, this study examines ease of use, usefulness and usage in terms of individual differences which cover not only basic characteristics but also experience and two-way interaction. To the best of our knowledge, no prior research has examined ease of use, usefulness and usage of print and electronic resources through this lens. The research questions of this study are: Do different users have different perceptions of print resources and electronic resources in terms of ease of use, usefulness, and actual usage? Specifically, do basic characteristics (gender, age, field) and experience (experience with library print resources, experience with library electronic resources, which library resources were used first) have effects on users' perceptions of print and electronic resources? For all the basic characteristics and experience, are there any significant interaction effects between any of the two factors on users' perceptions of print and electronic resources? We suggest a better understanding of the effect of individual differences have important implications for reducing the second-level capability divide and third-level outcome divide of library information resources.

4. Method and data collection

4.1 Measures development

All the constructs and the corresponding measure items were adapted from the previous literature to fit the context of this study. Specifically, the items measuring ease of use and usefulness were adapted from Venkatesh *et al.* (2003); the items measuring use were adapted from Venkatesh *et al.* (2003) and Zha *et al.* (2013).

After the instrument was developed, 20 graduate students from a university located in central China were selected for our pilot survey. These students had rich experience with and good knowledge of library resources. We also interacted with some of these students if they experienced any problems completing the survey. We adjusted wordings in several items accordingly. The complete instrument can be found in Appendix A. All items were measured with a 7-point disagree-agree-Likert scale (1 is "strongly disagree while 7 is "strongly agree"). We then conducted a large scale survey.

4.2 Data collection

The large scale survey data collection lasted for 8 weeks through an online survey website. In the survey questionnaire, we first described that university libraries are the main places to store information resources, providing information services and supports for students and teachers. We then listed some print resources such as print books, print journals and print tool books. We also listed a range of electronic resources, covering Chinese and English abstract databases such as SCI, SSCI, EI, CSSCI, and Chinese full-text databases such as China National Knowledge Infrastructure (CNKI), Wanfang Digital Periodicals, as well as English full-text databases published by Elsevier, Wiley, Emerald, Sage, IEEE, and Springer.

After publishing the questionnaire online, we randomly invited university library users to visit our online questionnaire where we explained the purpose of our study and solicited their participation. Finally, 273 valid responses were available. The difference of demographic characteristics between the participants who responded in the first two weeks and in the last two weeks is not significant. On this basis, response bias was not considered to be a concern. Table I documents the demographic information of these 273 respondents.

Category	Item	Frequency	Percent (%)
Gender	Male	136	50
	Female	137	50
	Total	273	100
Age	18-30	259	95
	31–35	13	5
	41–50	1	0
	51-60	0	0
	>60	0	0
	Total	273	100
Field	Natural sciences	68	25
	Social sciences	122	45
	Arts and humanities	44	16
	Inter-disciplinary sciences	39	14
	Total	273	100
Which library resources you	Print resources	240	88
used first	Electronic resources	33	12
	Total	273	100
Your experience with library	< 1 year	18	7
print resources (EXPR)	1-2 years	47	17
	2-3 years	56	21
CM	3-4 years	39	14
	> 4 years	113	41
	Total	273	100
Your experience with library	< 1 year	65	24
electronic resources (EXER)	1-2 years	54	20
	2-3 years	49	18
*	3-4 years	43	16
	> 4 years	62	22
	Total	273	100

Table I. Demographic information of survey respondents

As shown in Table I, among 273 respondents, 88% of respondents used print resources first while 12% of respondents used electronic resources first, which seems to be concordant with the transition being taking place from traditional print collections to hybrid collections including print-only, electronic-only, or collections in both print and electronic formats in Chinese university libraries.

Next, to complement the large scale survey above, we conducted qualitative interviews with

20 current users who were willing to participate in so as to capture more beliefs by users concerning print and electronic resources in terms of different formats such as books or journals, Chinese or English resources. Among 20 respondents, 9 were males and 11 were females. For age, 12 were between 18 and 25 years old, 7 were 26-30 years old and 1 were 31-35 years old. 19 claimed they used print resources first while only one claimed using electronic resources first, which seems to be concordant with the large scale survey. The interview protocol can be found in Appendix B.

5. Data analysis and result

5.1 Measurement model validation

We first assessed the measurement validity through content validity, convergent validity and discriminant validity (Straub *et al.*, 2004). With regard to content validity, since all the constructs and items in this study were based on the previous literature, we thus believe these constructs and items each have clear and correct meaning.

The whole measurement model consists of six reflective constructs. Table II lists the values of AVE (Average Variance Extracted), CR (Composite Reliability) and Cronbach's α . Reliability and convergent validity were assessed with CR and Cronbach's α and can be established with a score greater than 0.7 (Straub *et al.*, 2004). As shown in Table II, the smallest value of CR is 0.928 and the smallest value of Cronbach's α is 0.884, suggesting higher reliability and convergent validity of all the reflective constructs. Furthermore, convergent validity can be assessed with AVE and can be established with a score larger than 0.5 (Straub *et al.*, 2004). From Table II, we can see the smallest value of AVE is 0.769, suggesting sufficient convergent validity of all the reflective constructs.

Constructs	Items	AVE	CR	Cronbach's α
Ease of use of electronic resources (EUER)	3	0.925	0.974	0.959
Ease of use of print resources (EUPR)	3	0.812	0.928	0.884
Usefulness of electronic resources (UER)	5	0.890	0.976	0.969
Usefulness of print resources (UPR)	5	0.769	0.943	0.923
Use of electronic resources (USEER)	2	0.944	0.971	0.941
Use of print resources (USEPR)	2	0.900	0.948	0.890

Table II. Overview of measurement model

The correlations between constructs and square root of AVE can be seen in Table III. For each construct, the square root of its AVE is larger than its correlations with other constructs, suggesting sufficient discriminant validity (Straub *et al.*, 2004).

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		EUER	EUPR	UER	UPR	USEER	USEPR
	EUER	0.962					
	EUPR	0.306	0.901				
	UER	0.724	0.274	0.943			

Table III. Correlations between constructs and square roots of AVE

UPR	0.210	0.507	0.250	0.877		
USEER	0.658	0.134	0.686	0.105	0.971	
USEPR	0.020	0.361	0.048	0.481	-0.004	0.949

Note: diagonal elements are the square roots of the AVE of each construct.

Due to the sufficient validity of the measurement model, we thus believe it is appropriate to use these data for further analysis. We examine six constructs (latent variables) in this study and the score of them was each calculated based on their measurement models.

5.2 The effect of basic characteristics and experience

This study explores the effect of basic characteristics and experience on users' perceptions of print resources and electronic resources, focusing on six aspects (constructs), namely, ease of use of electronic resources (EUER), ease of use of print resources (EUPR), usefulness of electronic resources (UER), usefulness of print resources (UPR), use of electronic resources (USEER) and use of print resources (USEPR). Accordingly, we use the statistical method of 'compare means', including independent samples t test for two groups of independent samples and one-way analysis of variance (ANOVA) for more than two groups of independent samples.

Table IV shows the result of independent samples t test grouped by gender. The results suggest that there are no significant differences except for ease of use of print resources (EUPR) and use of print resources (USEPR) (bold values in tables IV to X indicate that the corresponding mean difference is statistically significant). From Table IV, it can be seen that the mean of EUPR for female users is 5.248 while the mean for male users is 4.875, suggesting that female users are more likely to perceive the ease of use of print resources. Meanwhile, the mean of USEPR for female users is 4.009 while the mean for male users is 3.307, suggesting that female users use print resources more frequently.

Туре	Constructs	Gender	N	Mean	Std. Deviation	t	Sig. (2-tailed)
Print	EUPR	Male	136	4.875	1.624	-2.188	.030*
resources		Female	137	5.248	1.155		
	UPR	Male	136	4.509	1.414	-1.959	.051
		Female	137	4.815	1.157		
	USEPR	Male	136	3.307	1.590	-3.843	.000***
		Female	137	4.009	1.422		
Electronic	EUER	Male	136	4.912	1.564	1.159	.248
resources		Female	137	4.696	1.514		
	UER	Male	136	5.053	1.410	-1.181	.239
		Female	137	5.255	1.421		
	USEER	Male	136	4.492	1.986	431	.667
		Female	137	4.592	1.855		

Table IV. Independent samples	t test group	bed by gender
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*p<0.05; **p<0.01; ***p<0.001

Given the sample distribution in terms of age, we combined some groups and conducted data analysis oriented to two groups, namely, 18-30 and >30. Table V shows the result of independent samples t test grouped by age, suggesting that there are significant differences except for ease of

use of print resources (EUPR). Specifically, the mean of EUER for users being 18-30 years old is 4.716 while the mean of EUER for users being older than 30 years is 6.429, suggesting that older users are more likely to perceive the ease of use of electronic resources. In terms of usefulness of library information resources, the mean of UPR for users being 18-30 years old is bigger than that for users being older than 30 years (4.727 versus 3.476), suggesting that younger users are more likely to perceive the usefulness of print resources. However, the mean of UER for users being 18-30 years old is smaller than that for users being older than 30 years (5.082 versus 6.485), suggesting that older users are more likely to perceive the usefulness of electronic resources. In terms of use of library information resources, the mean of USEPR for users being 18-30 years old is 3.714 and the mean of USEPR for users being older than 30 years is 2.641, suggesting that younger users are more likely to use print resources frequently than older ones. Meanwhile, the mean of USEER for users being 18-30 years old is 4.450 which is smaller than that (6.248) for users being older than 30 years, suggesting that older users are more likely to use electronic resources frequently.

Table V. Ind	ependent sam	ples t test					
Туре	Constructs	Age	N	Mean	Std. Deviation		Sig. (2-tailed)
Print	EUPR	18-30	259	5.068	1.414	.301	.763
resources		> 30	14	4.951	1.544		
	UPR	18-30	259	4.727	1.256	3.587	.000***
		> 30	14	3.476	1.532		
	USEPR	18-30	259	3.714	1.525	2.555	.011*
		> 30	14	2.641	1.644		
Electronic	EUER	18-30	259	4.716	1.528	-9.653	.000***
resources		> 30	14	6.429	0.561		
	UER	18-30	259	5.082	1.412	-7.487	.000***
		> 30	14	6.485	0.619		
	USEER	18-30	259	4.450	1.916	-6.729	.000***
		> 30	14	6.248	0.895		
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Table	V.	Independent	samples	t test	grouped	by	age
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*p<0.05; **p<0.01; ***p<0.001

The result of one-way ANOVA grouped by field is shown in Table VI. It suggests that there are no significant differences except for ease of use of electronic resources (EUER) and use of electronic resources (USEER). From Table VI, the mean of EUER for users from natural sciences (5.221) is the biggest one. Meanwhile, the mean of USEER for users from natural sciences (5.006) is also the biggest one. The results suggest that users from natural sciences are more likely to perceive ease of use of electronic resources than users from arts and humanities, and inter-disciplinary sciences. Meanwhile, users from natural sciences use electronic resources more frequently than those from arts and humanities, and inter-disciplinary sciences. Additionally, users from social sciences are more likely to use electronic resources than those from arts and humanities.

Table VI. One-way ANOVA grouped by field

Type	Field	N	N Mean	Std.	F	Sig	Multiple Comparisons
Туре	Tield	IN	Wiedli	Deviation	Г	Sig.	(Mean Difference, Std.

								Error)
Print	EUPR	Natural	68	5.159	1.447	.500	.683	
resources		sciences (1)						
		Social	122	5.012	1.325			
		sciences (2)						
		Arts and	44	4.909	1.409			
		humanities						
		(3)						
		Inter-discipli	39	5.226	1.668			
		nary sciences						
		(4)						
	UPR	Natural	68	4.759	1.462	.737	.531	
	-	sciences (1)						
		Social	122	4 624	1 1 3 6			
		sciences (2)			1.100			
		Arts and	44	4 816	1 168			•
		humanities	••	1.010	1.100			
		(3)				>		
		(5) Inter-discipli	39	4 4 4 3	1 596			
		nary sciences	57		1.550			
		(4)						
	USEPR	Natural	68	3 446	1 644	2 531	058	
	0.5LI II	sciences (1)	00		1.0.11	2.001		
		Social	122	3 687	1 513			
		sciences (2)	V					
		Arts and	44	4.168	1.466			
		humanities						
		(3)						
		Inter-discipli	39	3 369	1 467			
		nary sciences	0,	0.000	1.107			
		(4)						
Electronic	EUER	Natural	68	5.221	1.545	3.237	.023*	(1)-(3)** (.774, .294).
resources		sciences (1)						(1)-(4)* (.776, .306)
		Social	122	4.815	1.517			
		sciences (2)						
		Arts and	44	4.447	1.371			
		humanities						
		(3)						
		Inter-discipli	39	4.445	1.650			
		nary sciences						
		(4)						
	UER	Natural	68	5.472	1.414	2.601	.052	
		sciences (1)						
		Social	122	5.189	1.338			



*p<0.05; **p<0.01; ***p<0.001. Insignificant comparisons are omitted.

Table VII shows the result of one-way ANOVA grouped by experience with library print resources (EXPR), suggesting that there are significant differences for all constructs. A fairly large group of respondents (113, 41.39%) reported that they have been using library print resources for more than 4 years when they were asked to respond to "your experience with library print resources". For print resources, the mean of EUPR for users with less than 1 year of experience with print resources is 3.634 which is significantly different from the mean for the other four groups of users, suggesting this group of users are less likely to perceive the ease of use of print resources than users of other four groups. The mean of UPR for users with less than 1 year of experience with print resources is 3.536 which is significantly different from the mean for the other four groups of users, suggesting this group of users are less likely to perceive the usefulness of print resources than users of the other four groups. The mean of USEPR for users with less than 1 year of experience with print resources is 2.804 which is significantly different from the mean for users with 1-2 years, 3-4 years and more than 4 years of experience with print resources, suggesting this group of users are less likely to use print resources frequently than the latter three groups of users. For electronic resources, the mean of EUER for users with more than 4 years of experience with print resources is 5.443 which is significantly different from the mean for users with less than 1 year, 1-2 years and 2-3 years of experience with print resources, suggesting this group of users are more likely to perceive the ease of use of electronic resources than users with less than 1 year, 1-2 years and 2-3 years of experience with print resources. Meanwhile, the users with 3-4 years of experience with print resources are more likely to perceive the ease of use of electronic resources than the users with less than 1 year and 2-3 years of experience with print resources. The mean of UER for users with more than 4 years of experience with print resources is 5.707 which is significantly different from the mean for users with less than 1 year, 1-2 years and 2-3 years of experience with print resources, suggesting this group of users are more likely to perceive the usefulness of electronic resources than the users with less than 1 year, 1-2 years and

2-3 years of experience with print resources. Meanwhile, the users with 3-4 years of experience with print resources are more likely to perceive the usefulness of electronic resources than the users with 1-2 years and 2-3 years of experience with print resources. The mean of USEER for users with more than 4 years of experience with print resources is 5.607 which is significantly different from the mean for the other four groups of users, suggesting this group of users are more likely to use electronic resources frequently than the other four groups of users.

					Std			Multiple Comparisons
Туре		EXPR	Ν	Mean	Deviation	F	Sig.	(Mean Difference, Std.
					Deviation			Error)
Print	EUPR	< 1 year (1)	18	3.634	1.871	6.327	.000***	(1)-(2)*** (-1.506, .378),
resources		1-2 years (2)	47	5.141	1.321			(1)-(3)** (-1.226, .370),
		2-3 years (3)	56	4.860	1.522	•		(1)-(4)*** (-1.753, .389),
		3-4 years (4)	39	5.388	1.336			(1)-(5)*** (-1.611, .347)
		> 4 years (5)	113	5.245	1.213			
	UPR	< 1 year (1)	18	3.536	1.205	3.777	.005**	(1)-(2)*** (-1.209, .353),
		1-2 years (2)	47	4.745	1.297			(1)-(3)*** (-1.195, .345),
		2-3 years (3)	56	4.731	1.215			(1)-(4)** (-1.197, .363),
		3-4 years (4)	39	4.734	1.182			(1)-(5)*** (-1.213, .323)
		> 4 years (5)	113	4.749	1.328			
	USEPR	< 1 year (1)	18	2.804	1.731	2.412	.049*	(1)-(2)** (-1.246, .424),
		1-2 years (2)	47	4.050	1.461			(1)-(4)* (-1.052, .436),
		2-3 years (3)	56	3.569	1.484			(1)-(5)* (805, .388),
		3-4 years (4)	39	3.856	1.580			
		> 4 years (5)	113	3.609	1.531			
Electronic	EUER	< 1 year (1)	18	3.945	2.052	13.495	.000***	(1)-(4)** (-1.064, .403),
resources		1-2 years (2)	47	4.447	1.359			(1)-(5)*** (-1.498, .359),
		2-3 years (3)	56	3.947	1.623			(2)-(5)*** (995, .246),
	C	3-4 years (4)	39	5.009	1.373			(3)-(4)*** (-1.062, .295),
		> 4 years (5)	113	5.443	1.210			(3)-(5)*** (-1.496, .231)
	UER	< 1 year (1)	18	4.742	1.850	10.746	.000***	(1)-(5)** (965, .336),
		1-2 years (2)	47	4.501	1.243			(2)-(4)** (816, .287),
		2-3 years (3)	56	4.607	1.613			(2)-(5)*** (-1.206, .230),
		3-4 years (4)	39	5.317	1.195			(3)-(4)* (710, .276),
•		> 4 years (5)	113	5.707	1.133			(3)-(5)*** (-1.100, .217)
	USEER	< 1 year (1)	18	4.252	1.942	19.942	.000***	(1)-(5)** (-1.355, .431),
		1-2 years (2)	47	3.830	1.753			(2)-(5)*** (-1.777, .294),
		2-3 years (3)	56	3.473	2.052			(3)-(5)*** (-2.134, .277),
		3-4 years (4)	39	3.986	1.695			(4)-(5)*** (-1.621, .315)
		> 4 years (5)	113	5.607	1.417			

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*p<0.05; **p<0.01; ***p<0.001. Insignificant comparisons are omitted.

Table VIII shows the result of one-way ANOVA grouped by experience with library electronic resources (EXER). The results indicate that there are significant differences except for

EUPR, UPR and USEPR. Specifically, the mean of EUER for users with 3-4 years (5.310) and more than 4 years (5.769) of experience with library electronic resources is obviously bigger than the mean for users with less than 1 year (3.585) and 1-2 years (4.359) of experience with library electronic resources, suggesting that users with 3-4 years and more than 4 years of experience with library electronic resources are more likely to perceive the ease of use of electronic resources. The mean of UER for users with more than 4 years of experience with library electronic resources (6.011) is the biggest one, suggesting this group of users are most likely to perceive the usefulness of electronic resources (6.045) is the biggest one, suggesting this group of users are most likely to use the library electronic resources frequently.

					Std	•		Multiple Comparisons
Туре		EXER	Ν	Mean	Su. Deviation	F	Sig.	(Mean Difference, Std.
					Deviation			Error)
Print	EUPR	< 1 year (1)	65	4.964	1.545	.831	.507	
resources		1-2 years (2)	54	4.940	1.450			
		2-3 years (3)	49	4.979	1.408			
		3-4 years (4)	43	5.053	1.380			
		> 4 years (5)	62	5.344	1.285			
	UPR	< 1 year (1)	65	4.680	1.205	.899	.465	
		1-2 years (2)	54	4.624	1.331			
		2-3 years (3)	49	4.950	1.199			
		3-4 years (4)	43	4.602	1.153			
		> 4 years (5)	62	4.493	1.519			
	USEPR	< 1 year (1)	65	3.990	1.723	1.228	.299	
		1-2 years (2)	54	3.673	1.256			
		2-3 years (3)	49	3.436	1.364			
	С	3-4 years (4)	43	3.661	1.422			
		> 4 years (5)	62	3.475	1.768			
Electronic	EUER	< 1 year (1)	65	3.585	1.578	27.065	.000***	(1)-(2)** (774, .241),
resources		1-2 years (2)	54	4.359	1.322			(1)-(3)*** (-1.660, .248),
		2-3 years (3)	49	5.245	1.292			(1)-(4)*** (-1.725, .257),
		3-4 years (4)	43	5.310	1.160			(1)-(5)*** (-2.184, .232),
		> 4 years (5)	62	5.769	1.077			(2)-(3)*** (887, .258),
								(2)-(4)*** (952, .268),
								(2)-(5)*** (-1.410, .244),
								(3)-(5)* (524, .250)
	UER	< 1 year (1)	65	4.109	1.458	20.525	.000***	(1)-(2)*** (807, .230),
		1-2 years (2)	54	4.916	1.302			(1)-(3)*** (-1.332, .236),
		2-3 years (3)	49	5.441	1.347			(1)-(4)*** (-1.363, .245),
		3-4 years (4)	43	5.471	1.115			(1)-(5)*** (-1.902, .222),
		> 4 years (5)	62	6.011	0.928			(2)-(3)* (525, .246), (2)-(4)* (555, .255),

Table VIII. One-way ANOVA grouped by experience with library electronic resources

							(2)-(5)*** (-1.095, .232),
							(3)-(5)* (570, .239),
							(4)-(5)* (540, .248)
USEER	< 1 year (1)	65	2.878	1.773	35.605	.000***	(1)-(2)*** (-1.278, .288),
	1-2 years (2)	54	4.156	1.547			(1)-(3)*** (-1.834, .295),
	2-3 years (3)	49	4.712	1.840			(1)-(4)*** (-2.306, .307),
	3-4 years (4)	43	5.184	1.439			(1)-(5)*** (-3.168, .277),
	> 4 years (5)	62	6.045	1.116			(2)-(4)** (-1.028, .319),
							(2)-(5)*** (-1.889, .291),
							(3)-(5)*** (-1.334, .298),
							(4)-(5)** (862, .310),
*n<0.01: ***n<0.001 Insignificant comparisons are emitted							

*p<0.05; **p<0.01; ***p<0.001. Insignificant comparisons are omitted.

The result of independent samples t test grouped by which resources were used first is listed in Table IX. It indicates that there are significant differences except for usefulness of electronic resources (UER). Specifically, for print resources, the mean of EUPR, UPR and USEPR for users who used print resources first is 5.189, 4.789 and 3.740, suggesting this group of users are more likely to perceive the ease of use and usefulness of print resources and use them more frequently. For electronic resources, the mean of EUER, UER and USEER for users who used electronic resources first is 5.344, 5.570 and 5.424, suggesting this group of users are more likely to perceive the ease of use and usefulness of electronic resources and use them more frequently.

Туре		Used first	N	Mean	Std. Deviation	t	Sig. (2-tailed)
Print	EUPR	Print resources	240	5.189	1.340	3.520	.001**
resources		Electronic resources	33	4.140	1.638		
	UPR	Print resources	240	4.789	1.217	3.792	.001**
		Electronic resources	33	3.747	1.511		
	USEPR	Print resources	240	3.740	1.533	2.330	.025*
	С	Electronic resources	33	3.074	1.540		
Electronic	EUER	Print resources	240	4.730	1.517	-2.056	.046*
resources		Electronic resources	33	5.344	1.621		
	UER	Print resources	240	5.097	1.410	-1.797	.080
		Electronic resources	33	5.570	1.418		
	USEER	Print resources	240	4.421	1.927	-3.254	.002**
·		Electronic resources	33	5.424	1.620		

Table IX. Independent samples t test grouped by which resources were used first

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

5.3 The effect of two-way interaction

In order to examine the interaction effect of three basic characteristics and three types of experience on users' perceptions of print resources and electronic resources, two-way ANOVA was employed. We employed two-way ANOVA in terms of any of the two factors. The results of the significant interaction effects are shown in Table X. Among 90 (15*6) interaction effects, 13 significant interaction effects were found. From Table X, we can see that there are three significant interaction effects for UPR, EUPR, UER, EUER, respectively. For USEER, only the

interaction between EXPR and EXER is significant. Next, for the significant interaction effects, we employed simple main effects analysis respectively. The results were omitted for brevity.

Source	Dependent	Type III	df	Mean Square	F	Sig.
	Variable	Sum of				
		Squares				
Age * EXPR	UPR	11.227	2	5.614	3.741	.025*
Age * EXER	UPR	13.784	2	6.892	4.359	.014*
Field * EXPR	UER	47.260	12	3.938	2.394	.006**
	UPR	34.014	12	2.834	1.806	.048*
Field * EXER	EUPR	42.304	12	3.525	1.802	.048*
Field * Used first	UPR	19.050	3	6.350	4.161	.007**
EXPR * EXER	EUER	46.122	15	3.075	1.935	.021*
	UER	40.234	15	2.682	1.809	.034*
	USEER	56.773	15	3.785	1.717	.048*
EXPR * Used first	EUPR	20.415	4	5.104	2.956	.021*
	UER	29.064	4	7.266	4.390	.002**
EXER * Used first	EUER	20.096	4	5.024	3.018	.019*
	EUPR	19.035	4	4.759	2.591	.037*

Table X. Significant interaction effects by two-way ANOVA

*p<0.05; **p<0.01; ***p<0.001. Insignificant interaction effects are omitted for brevity.

5.4 Qualitative interviews

In addition to the findings above, the qualitative interviews with 20 current users present richer data about the use of specific types of print and electronic resources. For print resources, 15 respondents commented they mainly used print books and 5 respondents commented they mainly used both books and journals. For electronic resources, 20 respondents commented they mainly used electronic journals. For books, 18 respondents preferred print ones, 1 respondent preferred electronic ones and 1 respondent said it depended on different needs. For journals, 16 respondents preferred electronic ones while 4 respondents preferred print ones. For electronic journals, 15 respondents often used Chinese journals, and other respondents used both Chinese and English journals equally. For print journals, all respondents often used Chinese ones.

6. Discussion and implications

This study examines the effect of individual differences on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage. We suggest the findings have important implications. Ray and Chi (2003) suggested that female users were more linear and thorough in reading than male users and they read things more seriously. For the gender difference, we find that, compared with male users, female users perceive print resources to be easier to use, and they use them more frequently (see Table IV), concordant with the previous research which

suggested that female readers had a stronger preference for printed media than male readers (Liu and Huang, 2008; Al-Muomen *et al.*, 2012) and female users are more confident of using print resources (Al-Muomen *et al.*, 2012).

For age, some researchers reported no significant differences in the usage of print and electronic resources (Lærum et al., 2001; Tenopir et al., 2004), while others reported significant differences (Bar-Ilan et al., 2003; Borrego et al., 2007; Bar-Ilan and Fink, 2005). In this study, we find significant differences regarding users' perceptions of print and electronic resources except for EUPR (ease of use of print resources) (see Table V). Specifically, for print resources, younger users perceived higher levels of usefulness and usage than their older counterparts. This can be explained and complemented by our qualitative interviews which suggested that younger users enjoy using print resources and they usually use print resources, especially print books, for homework, study, enriching their knowledge or entertainment. For electronic resources, older users perceived higher levels of ease of use, usefulness and usage than younger users, which is supported by Ford et al. (2001) who suggested that younger users could not retrieve effectively what they need in the online environment and Borrego et al. (2007) who suggested that older users are more likely to use electronic resources to carry out their work in the process of consolidating their careers. We thus recommend that librarians need to treat younger and old users differently. For younger users, librarians need not worry about the use of print resources; they will however need to introduce these users to the useful functionality of electronic journals. With the help of librarians, younger users will be led to appreciate the ease of use and usefulness of electronic resources. For older users, librarians need not worry about the use of electronic resources; they will however need to introduce these users to the useful functionality of print books. With the help of librarians, older users will be led to appreciate the usefulness of print resources.

In prior studies, discipline plays different roles in users' perceptions of print and electronic resources. In the study by Gerke and Maness (2010), no significant differences were found among disciplines regarding users' perceptions of electronic resources, whereas other studies indicated that there were significant discipline differences regarding users' perceptions of print and electronic resources (Gardiner *et al.*, 2006; Brady *et al.*, 2006; Michael, 2006). In our study, we find users from natural sciences perceived that electronic resources were easier to use and they were more likely to use electronic resources, no significant differences were found across disciplines (see Table VI). However, four significant interaction effects concerning field were found, namely, the interaction effect between field and EXPR on UER and UPR, the interaction effect between field and used first on UPR.

We suggest experience with library resources by users play important roles. In this study, we examine the effect of experience with print resources, experience with electronic resources and which resources were used first by users. In terms of experience with library print resources, significant differences regarding users' perceptions of both print and electronic resources were found (see Table VII). The interesting thing is that users with more than 4 years of experience with print resources are most likely to perceive the ease of use and usefulness of electronic resources and used electronic resources most frequently while users with 1-2 years of experience with print resources used print resources most frequently. This can be complemented by our qualitative interviews which suggest that 14 out of 18 interviewees who have more than 4 years of experience

with print resources replied that they prefer electronic journals, and they commented that electronic journals are easily accessible, can be retrieved easily and quickly in the databases, thus adequately meeting their needs of study and research. Meanwhile, we can see three significant interaction effects between EXPR and EXER on EUER, UER and USEER, respectively.

In terms of experience with library electronic resources, there were significant differences regarding users' perceptions of electronic resources and no significant differences regarding users' perceptions of print resources. From Table VIII, we can see that users with more experience with electronic resources are more likely to perceive the ease of use and usefulness of electronic resources and use them more frequently. In other words, users with less experience with electronic resources are less likely to perceive the ease of use and usefulness of electronic resources and use them less frequently. Consequently, simply making electronic resources available cannot guarantee success. The second-level capability divide and the third-level outcome divide for electronic resources largely exist across users with different years of experience with electronic resources. This is a big challenge since librarians in university libraries often encounter the big change of their users due to newly registered users and the leave of experienced users after graduation. We thus recommend that librarians should never stop user training for the new users of electronic resources who need to take the first step and for the users with fewer years of experience with electronic resources who may probably abandon electronic resources on the way due to the second-level and third-level digital divide brought by the lack of experience.

In terms of which resources were used first by users, there are significant differences regarding users' perceptions of print and electronic resources except for UER (usefulness of electronic resources). Specifically, users who used print resources first are more likely to perceive the ease of use and usefulness of print resources and used print resources more frequently. compared with the users who used electronic resources first. Meanwhile, users who used electronic resources first are more likely to perceive the ease of use of electronic resources and used electronic resources more frequently, compared with the users who used print resources first. Following Ashcroft (2004) who suggested that user training may take many forms according to the ability of the user, we recommend librarians should actively interact with their users so as to understand and capture the exact nature of their experience regarding which resources were first used, thus providing personalized services accordingly. Moreover, librarians should make full use of their knowledge about the exact nature of print and electronic collections across different fields, guiding new users to put priority to the richer resources (print or electronic) oriented to the corresponding field so that both print and electronic resources can be effectively and efficiently used by users. This leads us back to the above discussion and recommendation that users' experience with library information resources should be paid much attention by librarians so that the second-level and third-level digital divide of library information resources can be much reduced and the usage of them can be much improved.

Our qualitative interviews suggest that print books and electronic journals seem to be salient as preferred sources. Most respondents expressed positive attitudes towards print books: "it is convenient to read. I like the experience of reading print books"; "print books let me read carefully"; "compared with e-books, reading print books is more comfortable"; "print books suit my reading habit"; "print books let me easily focus on my study and it is easy to make notes"; "I can take the print book with me where I go, showing that I am knowledgeable". At the same time, most respondents expressed positive attitudes towards electronic journals: "it is convenient to download and carry"; "searching for relevant documents based on key words can help accomplish my task quickly"; "compared with print journals, electronic ones are much richer"; "it is easier to locate the information I need, it is easier to present and communicate with others"; "it is more current"; "it is easy to get, I don't need one whole issue, electronic journals let me obtain what I have interests in". We thus suggest print books and electronic journals should be paid specific attention by librarians. For example, for younger users, librarians need to introduce the useful functionality of electronic journals so that younger users, librarians need to introduce the useful functionality of print books so that older users will be led to appreciate the ease of use and usefulness of electronic resources. For older users, librarians need to introduce the useful functionality of print books so that older users will be led to appreciate the useful functionality of print books of print books of print resources.

7. Conclusion

Print resources and electronic resources are both important library information resources. As indicated by Siebenberg *et al.* (2004, p.437), "print is the doorway through which students enter the field in its broadest context", whereas "electronic is how they find specific bits of information". This study explores the effect of both basic characteristic differences and experience differences on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage in the context of Chinese university libraries. Meanwhile, this study employs two-way ANOVA to explore significant interaction effects. Furthermore, the quantitative analysis is usefully supplemented by the qualitative interviews which present richer data about the use of specific types of print and electronic resources. We made recommendations and suggestions accordingly. Given most of users use the combination of both print formats and electronic formats (Dilevko and Gottlieb, 2002; Shelburne, 2009), we believe the findings of this study will help Chinese university libraries recognize and meet the diversified information needs of their users more specifically and appropriately, with the result that the second-level capability divide and the third-level outcome divide regarding library information resources can be much reduced.

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Constructs	Definitions	Items
Ease of use of	The amount of effort	1. Learning to use electronic resources in
electronic resources	required to use	my university library is easy for me
	electronic resources	2. It is easy for me to become skillful at
		using electronic resources in my university
		library
		3. Overall, electronic resources in my
		university library are easy to use
Ease of use of print	The amount of effort	1. Learning to use print resources in my
resources	required to use print	university library is easy for me
	resources	2. It is easy for me to become skillful at
		using print resources in my university
		library
		3. Overall, print resources in my university
		library are easy to use
Usefulness of electronic	The degree to which	1. Electronic resources in my university
resources	using electronic	library allow me to complete task fast
	resources would	2. Electronic resources in my university
	improve performance	library improve my study (work)
		performance
		3. Electronic resources in my university
		library improve my study (work) efficiency
		4. Electronic resources in my university
		library allow me to study (work) more
		easily

Appendix A. Constructs and items

		5. Electronic resources in my university
		library are useful to me
Usefulness of print	The degree to which	1. Print resources in my university library
resources	using print resources	allow me to complete task fast
	would improve	2. Print resources in my university library
	performance	improve my study (work) performance
		3. Print resources in my university library
		improve my study (work) efficiency
		4. Print resources in my university library
		allow me to study (work) more easily
		5. Print resources in my university library
		are useful to me
Use of electronic	The actual usage of	1. I often used my university library's
resources	electronic resources	electronic resources over the past six
	with respect to the	months
	frequency of use and the	2. I spent a lot of time using my university
	amount of time involved	library's electronic resources over the past
		six months
Use of print resources	The actual usage of	1. I often used my university library's print
	print resources with	resources over the past six months
	respect to the frequency	2. I spent a lot of time using my university
	of use and the amount of	library's print resources over the past six
	time involved	months

Appendix B. Interview questions

- 1. For print resources in your university library, do you mainly use print books, print journals, print tool books or others? Why?
- 2. For electronic resources in your university library, do you mainly use e-books, e-journals or others? Why?
- 3. For books, do you prefer using print ones or electronic ones? Why?
- 4. For journals, do you prefer using print ones or electronic ones? Why?
- 5. For electronic journals, do you often use Chinese ones or English ones? Why?
- 6. For print journals, do you often use Chinese ones or English ones? Why?
- 7. For different kinds of information resources mentioned above, which ones do you think more useful? Why?
- 8. For print and electronic resources, are there any other issues that you would like to tell us about?

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23