Digital Library use Intention Research: an Explanation based on Theory of Reasoned Action and Technology Acceptance Model

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ABSTRACT

Combing the theory of reasoned action and technology acceptance model, the paper explained the phenomenon of digital library use intention. The results revealed that the theory of reasoned action and technology acceptance model are the proper perspective to explain the digital library adoption. In practice, building the easy and useful digital library, forming user’s positive attitude and intimate persons’ influence are all the important factors to stimulate users’ intention of using the digital library. Furthermore, this study also examined the nonlinear relationship between behavior attitude and subjective norms. The result showed that there is negative synergy between them.

INTRODUCTION

Digital library becomes an important carrier of social information resources. Its potential value of application is high. But more attentions are paid to construction and the use of digital library is ignored. Moreover, due to the fact that the construction of digital resources in our country is often dominated by different departments, the information resources are only confined to sharing within the department. Although the government has invested a lot of money on the construction of digital library in colleges and universities, its use is limited by poor management and system constraints \cite{1}. At present, the main users are from the faculty and staff. Even for internal staff, the use of information resources status is uncertain. After communicating with some administrators in domestic university libraries, we found that they are also concerned with the use of digital library resources and how to improve the user's willingness to use.

To solve this problem, we can use the theory of Information System Adoption research. Information System Adoption refers to the process of information system in a specific time period, in which a group of members gradually use a specific channel and eventually become a part of the process of an indispensable group \cite{2}. The Research of Adoption is concerned about the various factors that impact the user’s application \cite{3}.

The Research of Digital Library’s Adoption refers to the digital library gradually adopted by teachers and students, and eventually become an important auxiliary tool for scientific research and teaching and learning process. If the early research of digital
library construction is to discuss "yes" or "no" problem, the research on the adoption of
digital library is to discuss whether it is good to use.

Overall, the current research on the use of digital library pays more attention to the
technical aspects, but ignores the user’s intention to use. In this study, the problem will
be actively explored.

THEORETICAL BACKGROUND

The research on individual psychology and behavior has always been an important
issue in the field of social psychology. The Theory of Reasoned Action was proposed
by Ajzen and Fishbein in the 1970s, which laid the foundation for the study of this
problem. The Theory of Rational Action holds that the individual's intention is an
important pre-determined factor to determine the individual's behavior, and the
intention is determined by both the individual’s attitude and subjective norm. Attitude is
the individual's belief and the assessment of the result of the conduct. Subjective norms
refer to the individual's belief that the intimate person thinks that he should or should
not perform an act. The rational behavior theory explains the psychological motive of
the user’s application of certain information system from the individual level. The
adoption of the rational behavior theory to study the digital library can reveal the system
usage from the user's point of view and avoid the evaluation of the system from the
perspective of construction. So it can reveal the user’s usage of information resources.

In addition, the current domestic research on digital library adoption relies on the
Technology Acceptance Model (TAM), emphasizing the impact of technical factors on
the adoption of digital libraries [4-5]. The TAM was first proposed by Davis and was
widely used in the field of information systems [6]. The main purpose of this model is to
explain the determinants of information systems being widely used, and it holds that the
Perceived Ease of Use and the Perceived Usefulness have a significant impact on the
user's attitudes. The Ease of Use reflects the extent to which a specific information
system is easy to use for the individuals. The Usefulness reflects the degree to which a
particular information system works for an individual. Based on the Theory of Rational
Behavior and the Technology Acceptance Model, a comprehensive model is
constructed to explain the adoption of digital library.

Based on the above analysis, the RBT explains the individual cognitive process, and
the TAM explains the influence of the technical characteristics on the user’s attitude [6].
Finally, a theory model is established to better explains the intention of digital library
users. This theory model will analyze the relationships between the external influencing
factors, the user's psychological cognition and the use intention

HYPOTHESIS

The RBT holds that attitudes and subjective norms have a significant effect on
behavioral willingness, and this assumption has been supported by a large number of
empirical results [7]. As a digital library user, if he or she has a positive attitude towards
the target system, it will increase the user's willingness to use the material. When digital
library users frequently use the digital libraries, the people around them will increase
the intention to use. Thus, it assumes that the attitudes and subjective norms have a positive impact on the use of digital libraries.

H1: The attitude has a significant positive impact on the use of digital libraries.

H2: The subjective norm has a significant positive impact on the use of digital libraries.

The results of some non-information systems research show that the interaction between attitudes and subjective norms is relevant to the willingness to use. For example, the interaction of attitudes and subjective norms can be a good predictor of an adult’s drinking and drug abuse. Titah confirms that this nonlinear interaction is also present in the context of information system applications [7], which appears as a significant correlation between the behavioral intention of smoking, alcoholism, and drug abuse for minors [8]. There is an alternative relationship between the attitudes and the subjective norms, that is, in the case of higher attitudes, the marginal utility of subjective norms diminishes; in the case of high subjective norms, the marginal utility of attitudes decreases. Based on the above research, it is assumed that the interaction between attitudinal and subjective norms has a negative effect on the use of digital library, that is, the relationship between attitudes and subjective normative variables is negative.

H3: The interaction between the attitude and the subjective norms has a significant negative impact on the use of digital libraries.

Davis' TAM has received extensive attention in the field [6], although the TAM model was originally used to explain the adoption of software systems in employees, this theory is widely used to validate different types of users, different types of systems, and even e-commerce systems [9]. The TAM model suggests that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) affect the attitudes of individuals, and the attitudes affect the intention of use, which is consistent with the theory of rational behavior.

PU means "the user believes that the use of information systems can improve the degree of job performance", and PEOU means "the user believes that the use of information systems can bring convenience to the work." PEOU affects PU because the user generally has a "more simple and useful" subjective judgment [9]. Based on the above analysis, the assumptions are as follows:

H4: PU has a significant positive impact on the user’s attitude to the digital library.

H5: PEOU has a significant positive impact on the user’s attitude to the digital library.

H6: PEOU has a significant positive effect on PU.

RESEARCH DESIGN AND RESEARCH METHODS

Research Methods and Questionnaire Design

In this study, the questionnaire survey is used to test the theoretical model. The main reason is that questionnaire is a kind of normative method in the information system research. There are credible rules to follow in the variable measurement and the data analysis process. In addition, the digital library adoption can draw on research results from information system field, and the theory of the digital library adoption has been relatively mature. Therefore, it is suitable for the use of questionnaire research methods [10].
The contents of the questionnaire consists of two parts: the basic situation of the respondents and the status of the respondents’ adoption of digital library systems. The main content of the questionnaire measures the willingness to use [11], attitudes, subjective norms, PEOU [6]. These variables are based on foreign research questions [6] [7], and three people involved in the research independently translated them into Chinese. Prior to conducting formal research, three experts in the field carefully reviewed the questionnaire and proposed amendments to a number of issues. Five more questions were subsequently added on the questionnaire, and the surface validity of the questions was examined. According to the classification results of the problem, the items were modified and adjusted, and the final problem items are shown in TABLE I.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Question Items</th>
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<tbody>
<tr>
<td>Willingness to use</td>
<td>1. I intend to use the digital library to access the literature; 2. In the case of a variety of literature access options, I will first choose to use the digital library in this way; 3. I will recommend the use of digital libraries to my classmates and friends around me.</td>
</tr>
<tr>
<td>Behavioral attitude</td>
<td>1. It is a good idea to use a digital library system; 2. It is a wise idea to use a digital library system; 3. I like the idea of using a digital library system; 4. The use of digital library systems makes me happy.</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>1. Those who have an impact on my studies think that I should use the digital library system; 2. Those who are important to me in learning think that I should use the digital library system.</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>1. Learning to use the digital library system is simple for me; 2. I feel the use of digital library system to help complete what I want to do is very simple; 3. I feel the interaction with the digital library system is clear and easy to understand; 4. I find that the digital library system can be used very flexibly; 5. For me, becoming skilled at using the digital library system is easy; 6. I feel the digital library system is easy to use.</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>1. Using a digital library system at work can make me work faster; 2. Using a digital library system can improve my job performance; 3. Working with a digital library system at work can improve my productivity; 4. Using a digital library system can improve my work; 5. Using a digital library system makes it easier to work; 6. I find it is useful to use a digital library system for my work.</td>
</tr>
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</table>

Data Collection

Because the willingness of users is the object of the study, the objects of the questionnaire must have the opportunities to access digital library systems. With continuous improvement of developing digital libraries, many colleges and universities in China have established their own digital libraries. The users of the campus network are free to use the digital libraries. At the same time, students and teachers need to use digital library systems to obtain professional-related electronic literature. Therefore, the
users of digital library systems in this research are confined to teachers and graduate students in colleges and universities.

It took one month to distribute the questionnaires and collect data. The questionnaire distribution was divided into three phases. First, a questionnaire was issued in the teachers group, followed by two phases in the graduate students group. A total of 162 questionnaires were issued with the methods of filling, checking, and recycling on site, which ensured a higher recovery rate. The questionnaires were distributed three times and 145 valid questionnaires were obtained. The questionnaire recovery rate was 89.5%. Among all the valid samples, 81.2% were postgraduates, 8.28% were doctoral students, and the other 10.3% did not include information of their educational background.

Analytical Methods

SPSS12.0 and SmartPLS2.0.M3 software were used to preprocess and analyze the research data. SPSS is commonly used software for data preprocessing, which can analyze the reliability and validity of variables. Compared with other verification structural equation model software, Smart PLS software has the function of requiring less sample size and supporting the interaction of two variables.

RESULTS ANALYSIS
Reliability and Validity Test
RELIABILITY TEST

Reliability refers to the credibility and stability of a score measured by a questionnaire, that is, the results of the same group of test personnel in multiple tests are consistent. In this study, the Cronbach α coefficient in SPSS software was used to detect the reliability of the questionnaire. According to the empirical value, the Cronbach alpha coefficient is generally required to be at least greater than 0.65, and the ideal condition can be greater than 0.7. If the value is too small, the variable will not be well measured. The Cronbach alpha coefficients for each variable in this study are all greater than 0.7 (as shown in TABLE II) and meet the reliability requirements.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Reliability</th>
<th>Scale source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to use</td>
<td>0.739</td>
<td>(Fu, Farn, Chao 2006)</td>
</tr>
<tr>
<td>Behavioral attitude</td>
<td>0.831</td>
<td>(Taylor, Todd 1995)</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>0.853</td>
<td>(Taylor, Todd 1995; Venkatesh, Morris, Davis, Davis 2003)</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>0.949</td>
<td>(Davis 1989)</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>0.912</td>
<td></td>
</tr>
</tbody>
</table>

VALIDITY TEST

The validity of the questionnaire test item refers to whether the questionnaire measurement results reach the correct goal. The validity of the questionnaire mainly
considers three indicators: Face Validity, Content Validity and Construct Validity. The questionnaire items adopted in this study are based on the results of a large number of related research in China and abroad, and have been modified by the experts in the field, so the Face Validity and Content Validity are guaranteed. In this paper, the method of factor analysis will be used to verify the validity of the study.

Prior to factor analysis, the Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) were used to verify whether it was suitable for factor analysis. Spherical test is to check whether the correlation is different. If the correlation coefficient shows that spherical test is "significant", the related relationship can be carried on the factor analysis. The greater the value KMO, the better the correlation. The results of the adaptive analysis of each variable are shown in TABLE III.

<table>
<thead>
<tr>
<th>TABLE III. KMO AND BARTLETT'S TEST OF SPHERICITY.</th>
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<tr>
<td><strong>Test Parameters</strong></td>
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<td>KMO Sampling fitness quantity</td>
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Bartlett's Test of Sphericity
- Approx. Chi-Square: 2120.369
- Degrees of freedom (df): 153
- Significance level (Sig.): .000

Six variables, including attitude, subjective norms, perceived ease of use, usefulness, technology-based trust are factorized. All the questions are clustered into four factors: the characteristic values of the four factors are greater than 1; the corresponding factor load corresponding to each problem item is greater than 0.5; the coefficient of each problem term and the corresponding factor is larger than the coefficient of other factors. Therefore, the questionnaire items meet the requirements of construction validity.

**Path Check**

In this study, we constructed six hypotheses, and finally used Smart PLS to validate the hypothesis model. The final results are shown in TABLE IV All the assumptions of this study are supported.

<table>
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<th>TABLE IV. VALIDATION OF THE HYPOTHESES.</th>
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<tr>
<td><strong>Hypotheses</strong></td>
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<tr>
<td>H1 Attitude→the Willingness to use</td>
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<tr>
<td>H2 Subjective norms→the Willingness to use</td>
</tr>
<tr>
<td>H3 Attitude×Subjective norms→the Willingness to use</td>
</tr>
<tr>
<td>H4 Perceived usefulness→Attitude</td>
</tr>
<tr>
<td>H5 Perceived ease of use→Attitude</td>
</tr>
<tr>
<td>H6 Perceived ease of use→Perceived usefulness</td>
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</table>
Analysis and Discussion of Results

The support of H1 and H2 means that attitudes and subjective norms significantly affect the willingness to use, which proves that the rational behavior theory can explain the adoption of digital libraries in China. From the practical point of view, to improve the user's desire to use digital libraries, we recommend two types of work to be focused on: one is to help users to establish the positive attitude toward using digital libraries; the other is to form a supportive environment for using digital libraries.

The support of H3 indicates that the interaction between attitudinal and subjective variables has a negative effect on the willingness to adopt. The absolute values of the attitude and subjective norms are lower; the linear relationship between them has a greater impact on the willingness to use. This conclusion is consistent with the result that some studies suggest, that is, there is a non-linear correlation between subjective norms and attitudes [12]. According to this conclusion, library managers should make appropriate control of the user's attitude and exert appropriate influence on the environment. Otherwise, it will cause users' resentment and reduce users' willingness to use digital libraries.

The establishment of H4 and H5 indicates that perceived ease of use and perceived usefulness significantly affect users' attitudes. This conclusion proves that TAM can be used to interpret digital library adoption issues. From the results of the structural equation, the ease of use has a direct impact on attitudes (0.237), but also indirectly affect the use of attitudes (0.177), which shows that it is important for users to use digital library systems that are easy to use. The development of a simple and effective system may affect the users’ attitude.

CONCLUSIONS

This study uses the RBT as the main frame, combining TAM, and uses the digital library information system as target system to verify adoption of administrative organization information systems in China. The empirical test results show that rational behavior theory and technology acceptance model can explain the adoption of digital libraries in China. Since our questionnaires are confined to the university teachers and students, our results are limited in scope. More scenario variables of digital library are needed in future research to enrich our theoretical understanding of the factors that affect the adoption of digital library.

REFERENCES