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Factors Influencing User Behavior Intention to Use Mobile Library Application: A Theoretical and Empirical Research based on Grounded Theory

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Abstract: User behavior intention is an important evaluation criterion for the construction of mobile library application. To help libraries and mobile application, developers better understand factors influencing user behavior intention and jointly improve the mobile service quality of library. Based on grounded theory, this study experimentally manipulates user behavior intention to use mobile library application related to the survey questionnaire that was designed to obtain data from college teachers and students. The results showed that the user behavior intention to use mobile library application is mainly influenced by system feature (i.e., accessibility, relevance, and system help), interface feature (i.e., screen design, navigation, and term), and individual difference (i.e., performance expectancy, domain knowledge, and social influence). Furthermore, system feature and interface feature are the external driver of user's usage behavior intention, and individual difference is the internal driver of user's usage behavior intention.

Keywords: library service, mobile information service, mobile library application, usage behavior intention, grounded theory, structural equation modeling

1 Introduction

With the development of mobile Internet technology, the scale of Internet mobile terminal is expanding rapidly. In April 2020, China's Internet users reached 904 million, with an Internet penetration rate of 64.5%, mobile Internet had a dominant position in Internet industry, and the type and quantity of mobile application continues to rise (China Internet Network Information Center, 2020). As one of Internet mobile terminal, mobile library application is the extension of library mobile service and an innovative library service mode. Mobile library mainly includes three service mode, such as the SMS mode, the mobile web mode, and the mobile device (tablet PCs and smartphones) application mode. Mobile library application was classified as the mobile device application mode (Parsons, 2010; Liang & Guo, 2013; Vassilakaki, 2014). Mobile library application can integrate the basic functions of the library completely and give full play to the characteristics of mobile Internet to realize intelligent services, such as location-based service (LBS) (Junglas & Watson, 2008), book lending, and bibliographic barcode scanning. Mobile library application can help library to better meet the user needs in the mobile Internet context (Zhao & Gao, 2015). To meet the needs that user can have access to e-journals, e-books, books subscription information, library opening hours, and other e-resources and information at any time and in any place (Parsons, 2010; Rafique, Anwer, Sharmim, Minaei-Bidgoli, Gureshi & Shamshirband, 2018), many libraries independently or with mobile application developer have constructed mobile library application (Lai, Chiu, Huang, Chen & Huang, 2014). There is no doubt that mobile library application is the development direction of library mobile service (ChanLin & Hung, 2016; Fung, Chiu, Ko, Ho & Lo, 2016; Torres-Pérez, Mendez Rodriguez & Orduna-Malea, 2016).

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However, the utilization rate of mobile library application is not high; the actual application value has not been reflected (Wei, Chang & Cheng, 2015); and the degree of user acceptance and adoption of mobile library application is relatively low at present (Hu & Zhang, 2016). Thus, it is systematical studying user behavior intention to use mobile library application and figuring out factors influencing user's usage behavior intention that have an important significance for library to improve mobile service quality (Rafique, Almagrabi, Shamim, Anwar, & Bashir, 2020).

With the development of mobile Internet technology and mobile device form, mobile information services have been developing rapidly. Libraries, as professional institutions providing information services, have carried out the construction of mobile libraries to conform to the trend of *The Times*. Users can break through the limitations of time and space, and enjoy library services at any time and any place through mobile devices. Users' behavioral intention is an important measure of users' adoption, continuous use, and noncontinuous use. To develop and perfect mobile library, it is necessary to study the influencing factors of mobile library user behavior (Liu, Su, Akram & Abrar, 2020). However, through the literature review in Section 2, it can be seen that current researches about user behavior of mobile library application are insufficient and lack systematic construction process of model, whose selection of latent variables of model and generalization of conclusions need to be further verified.

The study reported in this article will improve current user's usage behavior intention of mobile library application by exploring the following research questions:

RQ1. What are the main factors influencing user behavior intention to use mobile library application?

RQ2. How do these factors influence user behavior intention to use mobile library application?

To answer the research questions, this article first adopted in-depth interview, focus group interview, and other methods to obtain user interview results. Second, the interview results were coded using grounded theory, and a theoretical model of factors influencing user behavior intention to use mobile library application was constructed. Third, the survey questionnaire was designed to collect sample data, and an empirical analysis was made to validate the theoretical model using partial least squares. Finally, factors influencing user behavior intention to use mobile library application were discussed, and some recommendations were put forward to improve and perfect the mobile service quality of library.

2 Literature Review

2.1 Mobile Library Service and Mobile Library Application

With the unceasing advancement of mobile technologies, the mobile library service has changed dramatically. Library/book on wheel is the oldest mobile library service, and also known as mobile bus library, mobile train library, and bookmobile. It transfers some library resources from library to places where there is no library, such as rural districts or remote areas, and provides library services. Later, short message service (SMS) was popular with library user and widely used to provide user with basic library services, such as the content alert service (Anbu & Mavuso, 2012), the library catalogue service (Goh & Liew, 2009), the reference service (Herman, 2007), and so forth.

Later, the further development of mobile technologies makes it possible that library user can have access to library information resources through using a mobile device and connecting a wireless network, so mobile web service of library emerged and many libraries started designing the service. For example, the Oriental Institute of Technology Library (OITL) in Taiwan provided user with due-day reminder service, renewal-request service, and others. The due-day reminder and renewal-request services were the first two mobile web services (Wang, Ke & Lu, 2012). The OITL user can receive e-mail and SMS notification a day before the borrowed items were due, and extend the due date through access to library website or using SMS. Most member institutions of the Association of Universities and Colleges of Canada (AUCC) created a mobile library website, which referred to any web presence accessible through the browser of mobile device and has been tailored in some way to the mobile context (Canuel & Crichton, 2011). The mobile library website provided user with library catalogue, library hours, contact information, account access, library location, library news, main library web site link, study rooms, and other services. The library catalogue existed in almost all mobile library website of member institutions of AUCC. For the purpose of providing users with a convenient mobile interface to obtain library resources and information, Fu Jen Catholic University library also created a mobile library website, where the most frequently used services included online search, library news, personal circulation status, book recommendations, seats in the learning commons, feedback, opening hours, and contact information (ChanLin & Hung, 2016).

At present, the mobile device application is widely introduced to various types of library, which includes mobile library application, WeChat (a social software developed by Tencent for instant messaging) library (Wei & Yang, 2017), and other social media applications (Zhu, 2016). Mobile library application is the main mobile library service in many libraries. To better design and apply mobile library application, and enhance user awareness about it, a few researchers have explored the applying status, the emerging technology applying, the system and platform designing of mobile library application, and so on (Pianos, 2012; Schnell, 2012; Miller, Vogh & Jennings, 2013; Wei, Chang & Cheng, 2015; Pu, Chiu, Chen & Huang, 2015; Ansari & Tripathi, 2017; Ghuloum & Allamki, 2017; Kerr & Pennington, 2018). For example, Pianos (2012) developed a specialized mobile library application to cater to the needs of researchers in business and economics. The application had four basic functions, such as search, favorites, libraries, and options. The function of libraries was LBS, by which library user can find the nearby library and the library they want to go. Wang, Yang, Li and Wang (2018) analyzed the factors of the mobile library users' attitude and behavioral intention from the perspective of information ecology. Wei, Chang and Cheng(2015) conducted a usability testing of mobile library application via pretest questionnaires, accomplishing tasks, and posttest surveys. The experiment results indicated that mobile library application was effective but the efficiency of it required improvement. The services provided by it were appealing and useful to users. Pu, Chiu, Chen and Huang (2015) designed and developed a mobile library application using android open source code. The application can be installed on tablet PCs, smartphones, and other mobile devices, and then library user can run the application and quickly search for book collection, read latest news of the library, and check their borrowing record.

2.2 Related Research in the User Behavior of Mobile Library Application

In recent years, drawn from various disciplines, a variety of models have been employed to explain user behavior about information systems (Yoon, 2016), such as technology acceptance model (TAM) (Davis, 1989), unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003), and ECM-ISC (Bhattacharjee, 2001), and others. TAM was constructed to pursue better measures for predicting and explaining user accepting information systems or technologies (IST)

by Davis (1989). Then, Venkatesh, Morris, Davis and Davis (2003) proposed the UTAUT by integrating eight models, including the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behavior, a model combining the technology acceptance model and the theory of planned behavior, the model of PC utilization, the innovation diffusion theory, and the social cognitive theory. TAM and UTAUT were widely used to study the user acceptance or adoption behavior of IST (Moon & Kim, 2001; Gefen, KaraHanna & Straud, 2003; Gruzd, Staves & Wilk, 2012). ECM-ISC was adapted from expectation confirmation theory (ECT) (Oliver, 1980) by Bhattacharjee (2001) and then adopted to study the factors influencing user intention to continue using IST.

In the library and information field, these models (i.e., TAM, UTAUT, ECM-ISC, ECM, or ECT) were applied to explore the user behavior of library emerging IST. For example, Kapoor, Dwivedi, Piercy, Lai and Weerakkody, (2014) explored the factors influencing the use of RFID systems in the library context by empirically testing the relevant constructs from the extended TAM. Chen, Chang, Kao and Huang(2016) proposed a new model that incorporated information system success model into TAM, and analyzed the factors influencing the user's usage behavior of digital library services in the National Central Library of Taiwan. Yuvaraj (2016) studied the adoption of social media technologies in the recruitment and selection process of library professionals and faculty members by constructing an UTAUT model. Cheng (2014) proposed the model of user continuance intention of digital library based on TAM, ECM, and so on. Joo and Choi (2016) analyzed the factors affecting students' continuance intention to use online library resources in the context of academic libraries through using an extended ECT.

A few researchers also proposed some user behavior models of mobile library application based on these models. Yoon (2016) constructed a conceptual structural model for user acceptance of mobile library application using TAM and analyzed factors influencing user acceptance of mobile library application in academic libraries. The experimental results showed that perceived usefulness, interactivity, and ease of use had significant effects on user attitude and intention to use mobile library application. Zhao, Deng and Zhou (2015) developed a model of user's continued usage behavior about mobile library application based on ECM-ISC and theory of information system success. The results demonstrated that perceived usefulness, expectation confirmation, and satisfaction had significant effects on the continuance usage of mobile library application. Chang (2013)

integrated UTAUT with task technology fit to explain user behavior intention to use mobile library application in university libraries. The results showed that performance expectancy, effort expectancy, social influence, and facilitating conditions influenced user behavior intention to use mobile library application. Furthermore, Hu and Zhang (2016) proposed an integrated model to examine behavior intention of Chinese university students toward mobile library application and found that user attitude is the main predictor of behavior intention, and the quality of mobile library application determined students' perception of usefulness.

3 Research Design

3.1 Methodology

To systematically study user behavior intention to use mobile library application, this study mainly adopted structural equation modeling and grounded theory.

3.1.1 The Grounded Theory

The grounded theory is a methodology jointly developed by Glaser and Strauss (1967), and commonly used to systematically develop theoretical understandings from rigorous qualitative data collection and analysis (Parker, 2018). The process of grounded theory is different from the deductive logic commonly used, in which the meaning and knowledge are previously established (Roman, Osinski & Erdmann, 2017). The grounded theory adopts a set of procedures based on codification processes and theoretical sampling (Roman, Osinski & Erdmann, 2017) to construct a model or theory. User's usage behavior intention of mobile library application is an intricate psychological behavior, and the common deductive logic may not fully and systematically analyze user behavior intention to use mobile library application. So the research used grounded theory to construct a theoretical model of factors influencing user behavior intention to use mobile library application. First, the interview results were coded via means of open coding, axial coding, and selective coding, so as to obtain influential factors of user's usage behavior intention about mobile library application. Second, a theoretical model was constructed about factors influencing user behavior intention to use mobile library application. Finally, the theoretical model was tested for saturation.

3.1.2 The Structural Equation Modeling

Structural equation modeling are well-recognized as significant and useful in analyzing intercorrelations among observed and latent variables (Song & Lee, 2004). Therefore, before the structural equation modeling was applied, a theoretical model based on the hypothesized relationship as described earlier was constructed using the grounded theory (Yanuar, Ibrahim & Jemain, 2010). Referring to variables in the theoretical model and related literature, and combining with basic characteristics of mobile library application, a survey questionnaire was designed to obtain sample data coming from college teachers and students using paper questionnaire and network questionnaire. Then an empirical analysis was made to discuss the factors influencing user behavior intention to use mobile library application using the structural equation modeling. Structural equation modeling is referred to as causal modeling, causal analysis, simultaneous equation modeling, analysis of covariance structures, path analysis, or confirmatory factor analysis (Ullman & Bentler, 2003), and this article selected the latter two to assess intercorrelations among the latent variables of the theoretical model.

3.2 Data Collection

Data collection includes two steps: (1) the acquisition of interview data for the model construction in quantitative analysis based on the grounded theory and (2) the acquisition of questionnaire data for empirical analysis in quantitative analysis based on the structural equation modeling.

3.2.1 Interview Data

In view of that the grounded theory requires respondents who have certain cultural level and cognitive ability, this interview took college teachers and students as objects. Furthermore, the study required that the college teachers and students were willing to accept this interview. Thirty-six college teachers and students were interviewed, including 8 teachers and 28 students from Wuhan University, Huazhong University of Science and Technology, Nanjing University, Fudan University, and Shanghai Jiao Tong University. The interview was conducted according to semi-structured interview outline, which mainly sets up guiding question and is launched around the research goal with a view to fully understand

the perception of respondents. The following are the five main problems:

- QS1. Did you have used the mobile library application of your university?
- QS2. Would you like to adopt the mobile library application?
- QS3. What do you think of the mobile library application in your university?
- QS4. What factors do you think affect your usage behavior intention of mobile library application?
- QS5. What factors do you think can be improved about mobile library application of your university?

The interview was recorded by recording pen and word software, so as to save the interview results completely. It was divided into individual in-depth interviews and focus group interviews. The individual in-depth interviews of 20 interviewees were an average of 1 h per person, and the focus group interviews of 16 interviewees were conducted four times, which were an average of 2 h per time. After the interview, 120,000 words of interview results were obtained via sorting audio data and text records. The interview results of 28 college teachers and students were randomly selected to make open coding, axial coding, and selective coding, including 16 individual in-depth interview results and 3 focus group interview results. The rest of the eight interview results were used to make a theoretical saturation test, including four individual in-depth interview results and one focus group interview result.

3.2.2 Questionnaire Data

3.2.2.1 Questionnaire Design

Five-point Likert scale is adopted in the questionnaire, which was designed according to the basic hypotheses in Section 5. In the process, the questionnaire is divided into the following parts:

- (1) Guide language. It expounds some professional terms that the study purpose and questionnaire involved.
- (2) Basic information about the users. It includes gender, identity (student or teacher), and degree of users.
- (3) Variable measurement items. It includes accessibility, relevance, system help, screen design, navigation, term, performance expectancy, domain knowledge, social influence, and user’s usage behavior intention. Five specialists and scholars in the library and information field were invited to discuss, revise, and give feedback on the questionnaire to ensure the contents comply with the research purpose

Table 1
Basic Information of the Respondents

Information	Item	Frequency	%
Gender	Male	235	55.82
	Female	186	44.18
Identity	Student	370	87.89
	Teacher	51	12.11
Education	Bachelor’s	303	71.97
	Master’s	89	21.14
	Doctorate	29	6.89

(Chiu, Chao, Kao, Pu, & Huang, 2016). Then, the questionnaires were sent to 16 college teachers and students to conduct a small sample of pre-research, and the content, format, items, order, and clarity of the questionnaire were again revised and improved. After revision, 34 questions of the variable measurement items remained in the questionnaire, as were shown in Appendix.

3.2.2.2 Data Sources

Using web and paper questionnaires, the questionnaires were sent to college teachers and students of Wuhan University, Huazhong University of Science and Technology, Nanjing University, Fudan University, and Shanghai Jiao Tong University. A total of 478 questionnaires were collected. After filtering the questionnaire data, 421 valid questionnaires were obtained with a rate of valid return of 87.08%, 183 of which came from paper questionnaires and 238 came from web questionnaires. The main filter criteria are: (1) if all items or many items in a row are the same score, it is invalid and (2) if there are many items not scored, it is invalid. Through descriptive statistical analysis of sample characteristics, it were found that male accounted for 55.82%, female accounted for 44.18%, students accounted for 87.89%, teachers accounted for 12.11%, bachelor’s accounted for 71.97%, master’s accounted for 21.14%, and doctorate accounted for 6.89%. Basic information of the respondents is shown in Table 1.

4 Model Construction

The model construction consisted of category extraction, theoretical construction, and saturation test. Especially, the category extraction was divided into open coding, axial coding, and selective coding. The coding process was in accordance with predetermined standards, and the standards mainly included the following three: (1) the original data statements were extracted according to the interview results about mobile library application, and other interview results would be filtered, (2) the subcategories and main categories were mainly coded on the basis of the latent variables in the TAM and UTAUT, which have defined these latent variables in detail (Davis, 1989; Linaard, 1994; Agarwal & Prasad, 1999; Thong, Hong & Tam, 2002; Venkatesh, Morris, Davis & Davis, 2003; Gefen, KaraHanna & Straud, 2003; Chang, 2013; Yoon, 2016; Hu & Zhang, 2016), and (3) five specialists and scholars in the library and information field were invited to discuss, analyze, define, and revise the subcategories and main categories to ensure the accuracy and reliability of coding process. After the category extraction, the subcategory, main category, core category, influencing user to use mobile library application and the link between categories, would be gotten. Then a theoretical model of factors influencing user behavior intention to use mobile library application was constructed in the theoretical construction and saturation test process.

4.1 Open Coding

In this study, line by line and verbatim analysis of interview results were conducted to select the original data statements and make it initialized. Then a total of 462 original data statements and the corresponding initial concept were obtained. Since the initial concepts are very complex and exist a certain degree of crossover, the original data statements with the same concept were further integrated and classified referring to the existing literature and the group discussion. Finally, 33 initial concepts and 9 subcategories were gained. Coding process, subcategories, and the original data statement are shown in Table 2.

4.2 Axial Coding

In view of the fact that the subcategories formed in open coding do exist intrinsic links, the nine subcategories were divided into three main categories (system

feature, interface feature, and individual difference) according to the interrelationships and logical levels between subcategories. The main categories and their corresponding subcategories are shown in Table 3.

4.3 Selective Coding

Through the step-by-step coding, it was found that all three main categories focus on user behavior intention to use mobile library application. Thus, the user's usage behavior intention is determined as core category, and the story lines in the core category are summarized as follows: the three main categories namely system feature, interface feature, and individual difference have a positive impact on user's usage behavior intention; system feature and interface feature are the external driver of user's usage behavior intention; and individual difference is the internal driver of user's usage behavior intention. Typical relational structures of the main categories are shown in Table 4.

4.4 Theoretical Construction and Saturation Test

After three coding processes, this study pointed out three main categories, such as system feature, interface feature, and individual difference, which have a positive impact on user behavior intention to use mobile library application, and initially established a theoretical model of factors influencing user behavior intention to use mobile library application, as shown in Figure 1. The saturation test of grounded theory is applied to verify whether the interview results are in a state of saturation, and to comprehensively analyze user behavior intention to use mobile library application. Therefore, based on the rest of eight interview results, the saturation test was conducted on the theoretical model. The test results show that the categories from open coding, axial coding, and selective coding are very rich. There is no new category and connection appearing between categories and the theoretical model is saturated.

Table 2
Categorization of Open Coding

Subcategory	Original data statement (initial concept)
Accessibility	I have access to mobile library application in the office, at home, and at school and can also download journal articles and read e-books online. (Access to library resources via mobile library application)
	When I use the mobile library application, I found that the application responds fast and does not get stuck at all. I am happy to use it. (Access speed)
	Last time, I was unable to download the journal articles outside the school using the website, but I can download it using mobile library application. (Access advantage via mobile library application)
Correlation	I found that the information resources provided by mobile library application are all that I need and are very useful to me. (Demand-related)
	I am very interested in information mobile library application recommends. (Related recommendation)
	Mobile library application has professional information resources related to my research. (Related resource)
System help	UI settings of mobile library application are the same as my usage habits. (Related habits)
	If I do not understand the operation of mobile library application, I can consult the staff in the feedback column. (Interaction)
	Mobile library application have the introduction of basic information about the software, I feel very good and happy to use it. (Basic information)
Screen design	Once we install a mobile library application, the basic functions of mobile library application will be introduced. (Introduction of first use)
	The function, service of mobile library application are regularly updated and prompted. I think the service is very thoughtful. (Service prompt)
	I think UI of mobile library application was well designed, people are willing to use it. (Screen style)
Navigation	I think UI of mobile library application is very similar with that of QQ and WeChat and I am willing to use it. (Reasonable user interface)
	Touch sensitivity of mobile library application is very good, which gives people a better experience. (Screen sensitivity)
	I think navigation bar design of mobile library application is very reasonable, the resources have been classified according to different disciplines. (Resource classification)
Term	We can design our own navigation bar according to our habits of using mobile library application. (Personalized navigation)
	Home page of mobile library application set up: “bookshelf,” “audio books,” “newspaper,” “open class,” “academic resources,” and other navigation bars. (Conventional navigation)
	The relevant terms on mobile library application are set very well, making it easy to understand what is said. (term name)
Performance expectations	In my search for journal articles, my first reaction was to have access “academic resources” and I found what I was looking for. (terminology)
	I think term should be set, so users can understand the meaning of term and are very convenient to use. (Term meaning)
	I think using mobile library application can help my study and work, and I often use it. (Helps to learn)
Domain knowledge	I think mobile library application can help me get information resources outside the school, such as journal articles, e-books, etc. (Usefulness)
	Personally, it is a lot easier to use a mobile library application than not to use it. (Convenience)
	I had used mobile library application and have some related knowledge about it, so I feel very easy when using mobile library application. (Related knowledge)
Domain knowledge	I think my operations are very clear when I search for some journal articles, which may be related to my knowledge. (Knowledge)
	I think I can find out the resources I want from the mobile library application. (Related experience)
	I found out that when I have used the mobile library more frequently and became more familiar with it, my using mobile library application was more comfortable. (Use experience)

Continued Table 2
Categorization of Open Coding

Subcategory	Original data statement (initial concept)
Social influence	My teacher recommended me to use mobile library application, so I use it. (Teacher influence)
	Libraries have given lectures on mobile library application before, so I think mobile library application do help my learning. (Lecture effects)
	There were some news about mobile library application in the library website of my university, so I use it. (Website impact)
	My friends and classmates had used the mobile library application and recommended me to use it. (Friend influence)

Notes: Original data statements are on behalf of the original words of teachers and students interviewed, and the statement in parentheses is the initial concept extracted from the original data statements. Only the original data statement covering all the content was selected for each subcategories. QQ is a social software developed by Tencent for instant messaging.

Table 3
Categorization of Axial Coding

Main category	Corresponding subcategory	Category connotation
System feature	Accessibility	Accessibility is about access performance of mobile library application, whether it can be quickly accessed, and whether there is no load situation.
	Correlation	Correlation is about that whether the services and contents of mobile library application are consistent with user's individual needs.
	System help	System help refers to the degree to which mobile library application provides user with the interaction, service prompt, basic information, and other services.
Interface feature	Screen design	Screen design is about that whether the screen style, interface size, sensitivity of mobile library application meet users.
	Navigation	Navigation is about information classification design of mobile library application.
	Term	Term is about the name of each button in mobile library application, which corresponds to the function of button.
Individual difference	Performance expectation	Performance expectation refers to the degree to which individuals think that the use of information technology can help them gain a sense of effectiveness in job performance.
	Domain knowledge	Domain knowledge refers to the degree to which individuals have the cognitive level of basic concepts and professional knowledge about mobile library application.
	Social influence	Social influence refers to the degree to which individuals think they should use mobile library application.

5 Model Validation

5.1 Model Elaboration and Hypothesis

In this article, quantitative research was carried out by proposing basic propositions and hypotheses. According to the model construction processes and the theoretical model, the following basic propositions and hypotheses were discussed.

Basic proposition 1

System feature positively affects user behavior intention to use mobile library application, and it is the external driver of user's usage behavior intention which mainly exerts the influence through the following three paths:

- (1) Accessibility of mobile library application positively affects user behavior intention to use mobile library application. The stronger the access performance of mobile library application is, the stronger the user's usage behavior intention is.

Table 4
The Typical Relational Structure of the Main Categories

Typical relationship structure	Connotation of relational structure	Representative statement (extracted from the typical structure)
System feature → user's usage behavior intention	System feature is the external driver of user's usage behavior intention, which affects user's usage behavior intention by self-performance of mobile library application.	When I use the mobile library application, I find that my system responds fast and does not get stuck at all, I am happy to use it. (Accessibility → user's usage behavior intention) I find that the information resources provided by mobile library application are all I need and useful to me, I will use it. (Correlation → user's usage behavior intention) Mobile library application have the introduction of basic information about the software, I feel very good and happy to use it. (System help → user's usage behavior intention)
Interface feature → user's usage behavior intention	Interface feature is the external driver of user's usage behavior intention, which affects user's usage behavior intention by self-performance of mobile library application.	I think user interface style of mobile library application of our school is perfect, people want to use it. (Screen design → user's usage behavior intention) We can design our own navigation bar according to our habits of using mobile library application. (Navigation → user's usage behavior intention) I think term should be set, so users can understand the meaning of term and are very convenient to use. (Term → user's usage behavior intention)
Individual difference → user's usage behavior intention	Individual difference is the external driver of user's usage behavior intention, which affects user's usage behavior intention by user perception.	I think using mobile library application can help my study and work, and I often use it. (Performance expectation → user's usage behavior intention) I find out that when I have used the mobile library frequently and became familiar with it, my using mobile library application is more comfortable. (Domain knowledge → user's usage behavior intention) Many people around me have used the mobile library application and they say it works well, so I install it later. (Social influence → user's usage behavior intention)

- (2) Correlation between mobile library application and users positively affects user behavior intention to use mobile library application. The more relevant service and content provided by mobile library application is related to the user's needs, the stronger the user's usage behavior intention is.
- (3) System help of mobile library application positively affects user behavior intention to use mobile library application. The better the system help of mobile library application is designed, the stronger the user's usage behavior intention is.

Proposition 1. System feature of mobile library application is positively correlated with user's usage behavior intention.

- H1a. Accessibility is positively related to the user behavior intention to use mobile library application.
- H1b. Correlation is positively related to the user behavior intention to use mobile library application.
- H1c. System help is positively related to the user behavior intention to use mobile library application.

Basic proposition 2

Interface feature positively affects user behavior intention to use mobile library application and it is the external driver of user's usage behavior intention which mainly exerts the influence through the following three paths:

- (1) Screen design of mobile library application positively affects user behavior intention to use mobile library application. The better the screen design of mobile library application is, the stronger the user's usage behavior intention is.
- (2) Navigation of mobile library application positively affects user behavior intention to use mobile library application. The better the navigation of mobile library application is, the stronger the user's usage behavior intention is.
- (3) Term of mobile library application positively affects user behavior intention to use mobile library application. The more the term design of mobile library application is reasonable, the stronger the user's usage behavior intention is.

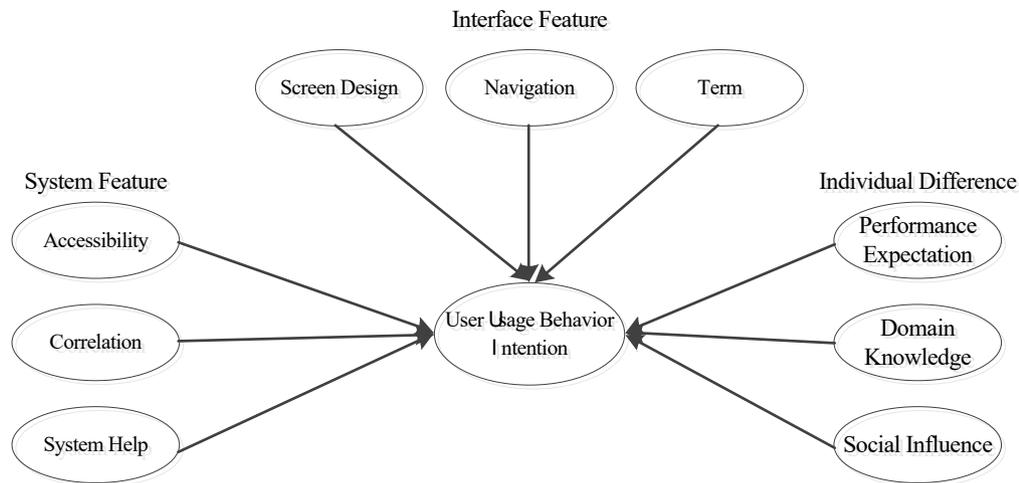


Figure 1. Theoretical model of factors influencing user behavior intention to use mobile library application.

Proposition 2. Interface feature of mobile library application is positively correlated with user's usage behavior intention.

- H2a. Screen design is positively related to the user behavior intention to use mobile library application.
 H2b. Navigation is positively related to the user behavior intention to use mobile library application.
 H2c. Term is positively related to the user behavior intention to use mobile library application.

Proposition 3. Individual difference of user is positively correlated with user's usage behavior intention.

- H3a. Performance expectation is positively related to the user behavior intention to use mobile library application.
 H3b. Domain knowledge is positively related to the user behavior intention to use mobile library application.
 H3c. Social impact is positively related to the user behavior intention to use mobile library application.

Basic proposition 3

Individual difference positively affects user behavior intention to use mobile library application and it is the internal driver of user's usage behavior intention which mainly exerts the influence through the following three paths:

- (1) Performance expectancy of mobile library application positively affects user behavior intention to use mobile library application. The higher the user's performance expectation to mobile library application is, the stronger the user's usage behavior intention is.
- (2) Domain knowledge of mobile library application positively affects user behavior intention to use mobile library application. The more the user's domain knowledge is abundant, the stronger the user's usage behavior intention is.
- (3) Social influence of mobile library application positively affects user behavior intention to use mobile library application. The larger the number of people using mobile library application around user is, the stronger the user's usage behavior intention is.

5.2 Data Analysis

5.2.1 Reliability and Validity Test

Reliability is a measure of the consistency and stability of questionnaire results. In this study, Cronbach's a coefficient was used to test the reliability of formal scales. In the evaluation of internal reliability, Cronbach's a is greater than 0.7, indicating that the data has considerable credibility (Nunnally, 1978). The results shown in Table 5 manifested that the Cronbach's a coefficients for all variables are greater than 0.8, so the sample data selected in this study had good internal consistency.

Validity refers to the fact that the items can indeed measure the variables and have validity, including the validity of content and the validity of construct. Questionnaire items were designed via adapting the relevant literature, so the questionnaire has a good content validity. In this study, exploratory factor analysis was used to test the validity of formal scales. The results shown in Table 5 manifested that all KMO values are greater than 0.7; all p values of Bartlett's spherical test are

Table 5
Reliability and Convergence Validity Analysis

Variables	Items	Cronbach's a	KMO	Bartlett's Cartesian	Bartlett's sphere test	Factor loading	Explanation variance (%)
Accessibility	3	0.809	0.771	633.699	0.00	0.784–0.895	70.546
Correlation	4	0.853	0.810	753.543	0.00	0.851–0.869	73.620
System help	4	0.804	0.792	525.235	0.00	0.748–0.826	69.860
Screen design	3	0.832	0.728	674.970	0.00	0.841–0.911	75.872
Navigation	3	0.864	0.731	677.968	0.00	0.869–0.902	79.715
Term	3	0.835	0.732	605.518	0.00	0.843–0.884	76.643
Performance expectation	4	0.917	0.719	505.846	0.00	0.874–0.937	71.401
Domain knowledge	3	0.823	0.833	1,248.509	0.00	0.855–0.864	76.342
Social influence	4	0.874	0.835	835.507	0.00	0.835–0.871	75.280
User's usage behavior intention	3	0.864	0.730	606.381	0.00	0.864–0.902	76.712

less than 0.001; the factor load of each variable is greater than 0.5; and all values of explanations variance is greater than 60%, so the questionnaire has good validity.

5.2.2 Structural Model Validation

By the test of validity and reliability, it was found that the questionnaire had good reliability and validity and could be further analyzed. This study used partial least square method to verify the theoretical model of factors influencing user behavior intention to use mobile library application and selected Amos 21 software to analyze the path coefficient of the theoretical model. The data of 425 questionnaires were imported into Amos 21 and processed to obtain path diagram of structural equation modeling, as shown in Figure 2.

According to verification results of the structural equation modeling, the impact of all factors influencing user behavior intention to use mobile library application has reached a significant level as shown in Table 6.

In system feature, the path coefficient of accessibility to user's usage behavior intention is 0.304; the parameter estimation value is $p < 0.001$; and accessibility positively affects user behavior intention to use mobile library application. It can be seen that the better the access performance of mobile library application is, the more the user is willing to use it. The path coefficient of relevance to user's usage behavior intention is 0.213; the parameter estimation value is $p < 0.01$; and relevance positively affects user behavior intention to use mobile library application.

It can be seen that the higher the similarity between the services provided by mobile library application and the user needs is, the more the user is willing to use it. The path coefficient of system help to user's usage behavior intention is 0.254; the parameter estimation value is $p < 0.01$; and system help positively affects user behavior intention to use mobile library application. It can be seen that the better the system help of mobile library application is, the more the user is willing to use it.

In interface feature, the path coefficient of screen design to user's usage behavior intention is 0.296; the parameter estimation value is $p < 0.01$; and screen design positively affects user behavior intention to use mobile library application. It can be seen that the better the sensitivity, screen style, and other screen design of mobile library application are, the more the user is willing to use it. The path coefficient of navigation to user's usage behavior intention is 0.312; the parameter estimation value is $p < 0.01$; and navigation positively affects user behavior intention to use mobile library application. It can be seen that the better the navigation design of mobile library application is, the more the user is willing to use it. The path coefficient of term to user's usage behavior intention is 0.235; the parameter estimation value is $p < 0.01$; and term positively affects user behavior intention to use mobile library application. It can be seen that the more the term design of mobile library application is reasonable and appropriate, the more the user is willing to use it.

In individual difference, the path coefficient of performance expectation to user's usage behavior intention is 0.356; the parameter estimation value is

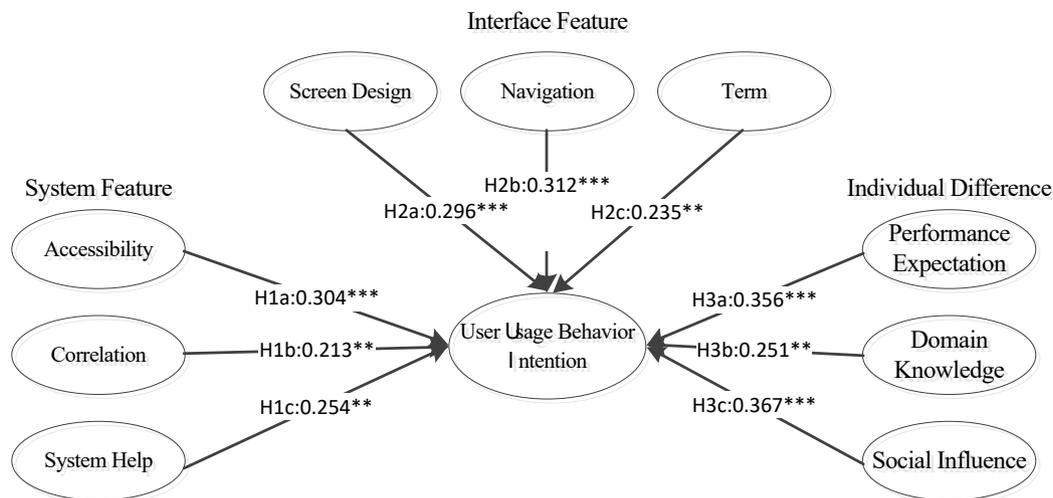


Figure 2. Structure model path coefficient. ** $p < 0.01$, *** $p < 0.001$.

$p < 0.01$; and performance expectation positively affects user behavior intention to use mobile library application. It can be seen that the higher the user's performance expectation is, the more the user is willing to use it. The path coefficient of domain knowledge to user's usage behavior intention is 0.251; the parameter estimation value is $p < 0.01$; and domain knowledge positively affects user behavior intention to use mobile library application. It can be seen that the richer the user's domain knowledge is, the more the user is willing to use it. The path coefficient of social influence to user's usage behavior intention is 0.367; the parameter estimation value is $p < 0.01$; and social influence positively affects user behavior intention to use mobile library application. It can be seen that the larger the number of people using mobile library application around user is, the more the user is willing to use mobile library application.

In summary, system feature and interface feature are the external driver of user usage behavior intention, and individual difference is the internal driver of user usage behavior intention. This result is consistent with conclusions of the grounded theory, so the theoretical model of factors influencing user behavior intention to use mobile library application was verified.

6 Conclusions and Implications

This article proposed the theoretical model of factors influencing user behavior intention to use mobile library application based on grounded theory, and explored the factors influencing user behavior intention to use mobile

library application. The results showed that system feature (i.e., accessibility, relevance, and system help), interface feature (i.e., screen design, navigation, and term), and individual difference (i.e., performance expectancy, social influence, and domain knowledge) were three main categories influencing user behavior intention to use mobile library application. The user behavior intention to use mobile library application is mainly influenced by system feature, interface feature, and individual difference. Moreover, system feature and interface feature are the external drivers of user usage behavior intention, and individual difference is the internal drivers of user usage behavior intention.

According to the above conclusions, mobile library application may be built and improved from three aspects such as system feature, interface feature, and individual difference, so as to enhance the willingness of user to use mobile library application.

In terms of system feature:

- (1) The library can enhance accessibility of mobile library application, such as enabling user to access and acquire library resources ubiquitously, and enhance access speed and user experience of mobile library application.
- (2) The library can enhance correlation between mobile library application and users. For example, librarians can analyze the needs of different user to library resources and provide them with relevant resources. Chief librarian can arrange some programmers to optimize recommendation service in mobile library application according to the user's usage habits.

Table 6
Model Test Results

Assumptions	Variables relationship		Path coefficient (<i>p</i>)	Result
H1a	Accessibility → user's usage behavior intention	Positive impact	0.304***	Valid
H1b	Correlation → user's usage behavior intention	Positive impact	0.213**	Valid
H1c	System help → user's usage behavior intention	Positive impact	0.254**	Valid
H2a	Screen design → user's usage behavior intention	Positive impact	0.296***	Valid
H2b	Navigation → user's usage behavior intention	Positive impact	0.312***	Valid
H2c	Term → user's usage behavior intention	Positive impact	0.235**	Valid
H3a	Performance expectation → user's usage behavior intention	Positive impact	0.356***	Valid
H3b	Domain knowledge → user's usage behavior intention	Positive impact	0.251**	Valid
H3c	Social influence → user's usage behavior intention	Positive impact	0.367***	Valid

p* < 0.01, *p* < 0.001.

(3) The library can perfect system help services of mobile library application. For example, librarians or other staff can set system help column in mobile library application to help new and old user make better use of the app. Facebook, Twitter, and other social media can be set in the feedback column of mobile library application for user interaction.

In terms of interface feature:

- (1) The library can improve screen design of mobile library application, such as designing the interface style of mobile library application according to the cultural background of library and the design style of library official website, and combine with the interface layout of social media application (i.e., Facebook, Twitter, and others) to design mobile library application UI layout.
- (2) The library can enhance navigation of mobile library application, such as classifying library resources according to different classification rules and designing corresponding navigation bars, and set up personalized sections, so that the user can design navigation bars according to his preference.
- (3) The library should improve term design of mobile library application. For example, different mobile library applications have different terms about the same content, so most used term should be selected to facilitate user's understanding. The library can also add the introduction of term, such as setting the meaning of various terms in the system help column of mobile library application.

In terms of individual difference:

- (1) The library can enhance user's performance expectations, such as introducing the influence of mobile library application to learning and working through lectures and other promotional methods, and user's perception of usefulness about mobile library application.
- (2) The library can enhance domain knowledge of user, such as promoting mobile library application through social platforms such as Facebook and Twitter, and promote user's understanding to mobile library application, such as carrying out lectures about mobile library application in the library.
- (3) The library can propagandize mobile library application to the public. For example, incentives, promotions, and other means can be used to encourage mobile library application user to recommend it, so as to influence more users to use mobile library application. Facebook, Twitter, and other social media can be applied to propagandize mobile library application, so as to enhance the popularity of mobile library application.

There are still many limitations in this study. The sample selection is mainly concentrated on students from five schools. The relationships between dependent variable and independent variable were discussed, but all kinds of complex correlations among the factors cannot be expressed. Limited by time, finance, energy, and other factors, this study did not discuss the difference of system feature, interface feature, and individual

difference influencing user usage behavior intention from the perspective of weight. In the future, we will expand the diversity of the research sample, explore to find deep relationships between main categories, and start from the importance of system characteristics, interface characteristics, and individual differences to users' behavioral intention to use mobile library applications so as to guide libraries to improve mobile library applications and enrich the user behavior research of mobile library applications.

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Appendix

Option Design of Variable Measurement Items

Factor	Variable	Content
System feature	Accessibility	H1a1: I can easily access information resources in mobile library application anytime.
		H1a2: The information resources in mobile library application are easily accessible.
		H1a3: I can easily access the information resources provided by mobile library application on my mobile phone.
	Correlation	H1b1: The information provided by mobile library application is relevant to information I need.
		H1b2: Mobile library application can provide enough resources to meet my needs.
		H1b3: Mobile library application provides up-to-date information on my research area.
		H1b4: I think using a mobile library application is very important for me to learn and work.
	System help	H1c1: Mobile library application can provide user consultation services.
		H1c2: Mobile library application provides a demonstration about how to use it.
		H1c3: The help information provided by mobile library application is easy to find.
		H1c4: Mobile library application can promptly recommend new information to user.
	Interface feature	Screen design
H2a2: User interface of mobile library application is similar to that of QQ, WeChat, and other mobile application frequently used.		
H2a3: Screen sensitivity is good and touch responses fast.		
Navigation		H2b1: Academic resources, open class, and other information resources are systematically classified.
		H2b2: I can set personalized navigation bar and customize related services.
		H2b3: Navigation design is reasonable, attracting users' attention.
Term		H2c1: Column names allow users to easily understand the contents.
		H2c2: Column terms are designed to prompt users to find relevant resources quickly.
		H2c3: Term should have a specific meaning and not be ambiguous.
Individual difference	Performance expectations	H3a1: Mobile library application is useful to me.
		H3a2: Mobile library application helps me with study and work.
		H3a3: The benefits of using mobile library application are much better than not using it.
	Domain knowledge	H3b1: I had knowledge of mobile library application before.
		H3b2: I have experience of using mobile library application.
		H3b3: I have a certain amount of expertise.
		H3b4: Domain knowledge will help me use mobile library application.
	Social influence	H3c1: My classmates, friends, teachers, and others are using mobile library application.
		H3c2: Some students or colleagues recommend me to use mobile library application.
		H3c3: Some classmates, friends, and colleagues say it is convenient to use mobile library application.
		H3c4: There are often friends sharing mobile library application in WeChat circle of friends.
	User's usage behavior intention	B1: I am happy to use mobile library application.
B2: I will use mobile library application.		
B3: I would recommend mobile library application for other people.		