A survey of the use of electronic resources at seven universities in Wuhan, China

Liyi Zhang
Center for Studies of Information Resources, Wuhan University, Wuhan, China, and
Pinghao Ye and Qihua Liu
School of Information Management, Wuhan University, Wuhan, China

Abstract
Purpose – The purpose of this paper is to report on users’ information behaviour in China, a topic which has not been researched extensively. The aim is to help producers and providers collect and develop more electronic resources.

Design/methodology/approach – The study investigates users’ information behaviour at seven “211 Project” universities in Wuhan, a city in central China. These universities all have access to the resources of the National Science and Technology Library (NSTL). The questionnaire includes questions about respondents’ basic identifying information (educational level, job, etc.) and their information service requirements. Correlations among users’ education level, users’ jobs, users’ retrieval methods, literature use, etc. were analysed.

Findings – The results show that most NSTL users are graduate students and young staff members. and the number of male users surpasses female ones slightly. The purpose of the utilisation of electronic resources for customers is scientific research, teaching and the need for self-development. During a year, the demand of users is the highest in March and the lowest in August. The users’ knowledge service types include learning the progress of science and technology, citation retrieval and analysis, statistical analysis, intelligent retrieval and knowledge aggregation.

Practical implications – The findings suggest that electronic resource producers should offer more foreign literature and providers should improve the quality of services.

Originality/value – The paper provides suggestions for the further improvement of NSTL to fulfill the information needs and requirements of users.

Keywords Electronic media, Consumer behaviour, User studies, Academic libraries, China

Paper type Research paper

1. Introduction
Electronic resources, particularly journal literature have become a major element of library collections worldwide. In colleges and universities, electronic resources, as an integral part of an institute’s libraries and academic resources, are assisting learning, teaching and research activities. Therefore, it has become a great challenge for the electronic resource producers and providers to understand the variety of users’ demands in order to improve the efficiency and value of the utilisation of electronic resources. This needs to be undertaken so that the libraries can attract more potential users and enhance the service quality and customer satisfaction.
At present, there are four major providers of electronic resources in China:

1. Resource System of Wan Fang data;
2. Chongqing VIP Information (VIP);
3. China National Knowledge Infrastructure (CNKI); and
4. National Science and Technology Library (NSTL).

Figure 1 reveals that NSTL is distinctly superior to the other three collections in the holdings of articles/items and holdings of foreign journal titles (published in non-Chinese languages). As a national science and technology literature service institution, NSTL is aimed at users in the scientific and technological fields in China. Its objective is to collect and develop science and technology literature resources in the fields of science, engineering, agriculture, medicine and so on. This mission supports national science and technology development and the principle of unified procurement/standardized processing, joint internet access and resource sharing. The size of its holdings and the importance of its mission is the basis for choosing NSTL as the target of investigation in this paper.

In order to upgrade 100 Chinese universities into world-class institutions in the middle 21st century, China started the Chinese Higher Education Schema, named the 211 Project in 1993. At present, there are 110 universities in the 211 Project. As a key region for education in China, Wuhan, a megalopolis in central China, has seven 211 Project universities. By the end of 2007, the number of students in Wuhan reached 1,041,100, ranking first in China (Wang and Hu, 2008). Thus, Wuhan is a major market for electronic resource producers and providers. Hence, it is representative and reasonable to choose the seven 211 Project universities in Wuhan as participants in the research conducted in this paper.

This study analyses the correlation between the users’ profession and their use behaviour of e-resources and puts forward some suggestions for NSTL to introduce new products and improve the quality of services. The survey results should also be useful for other electronic resource providers.


2. Review of literature
Research on electronic resources and their use by different demographic groups in an institution establishes an important foundation for selecting and providing effective library holdings and services. Several factors have been found to be associated with the use of electronic resources and digital libraries by a university faculty. Subject discipline, profession, sex and age are typical factors related to the use of electronic libraries in this group. Such a foundation allows for the development of both useful theory and practical application. Therefore, research on electronic resources, particularly by different user groups is of significant theoretical and practical value.

Many researchers have conducted comprehensive studies on electronic resources from various perspectives. Online Computer Library Center (OCLC, 2002) in the US have issued two research findings involving undergraduates, graduate students and teachers. Both emphasised the important role that electronic resources had played in each of these groups' information behaviour, and found that college and university students look to campus libraries and library websites for their information needs. The JUSTEIS project in the UK (Urquhart et al., 2003) explored the main reasons for students' use of electronic resources and the key technological factors for success. The results demonstrated that, although the traditional libraries and printed books still played an important role, an increasing number of people have started using or tended to use electronic resources.

Barrett (2005) studied the information retrieval behaviour of graduate students in the humanities. He pointed out that in spite of widely applied electronic information technology, students still complained about the lack of electronic versions of the key resources. George et al. (2006) investigated graduate students' usage of electronic resources at Carnegie Mellon University in the US through semi-structured interviews and reported that, while browsing information on the internet, students usually depend on the help of the library staff, especially academic staff, to implement their search activities. Gardner et al. (2008) conducted a survey of the electronic resource collections in the top 100 colleges and universities in the US and discovered that the quality of library circulation and the ability to support faculty teaching and research has been improved tremendously by such collections.

Kuhlthau's (1991) model of the information-seeking process, which was initially developed from empirical research into the information-seeking behaviour of students (and other library users), is one of the most well-known works on student information behaviour. A particular strength of this model is that, in addition to identifying different stages of the information seeking process (namely, initiation, selection, exploration, formulation, collection and presentation), which students typically experience, it also presents the feelings, thoughts, activities and tasks associated with each stage. Subsequent studies have examined the use of different information sources, including electronic sources provided by students.

Ali (2005) found that Boolean logic and truncation were the most often used search facilities by the users of the Indian Institute of Technology (IIT) in Delhi. Lack of printing facilities, terminals and trained staff are the major reasons that would discourage users from accessing the electronic information services. This survey also revealed that almost 60 per cent of the users faced difficulties while browsing e-resources.
A survey conducted at the Catalan universities in Spain by Borrego et al. (2007) showed a high proportion of teaching and research staffs were aware of the collections of electronic journals and there was an increasing preference for electronic resources in preference to printed materials. The collection of electronic journals is highly valued and most users expect to increase their use of them during the next few years. The results also confirm the importance of discipline and age as explanatory factors in the use of electronic journals. Dilek-Kayaoglu (2008) examined the usage of electronic resources by a specific academic community in Istanbul, Turkey in which the majority of respondents supported the transition from print to electronic only. This support particularly came from the faculty of natural sciences. About 60 per cent of the respondents reported that the major barrier to use of e-journals was the lack of subscriptions in their field. Awareness of electronic resources by faculty and administrators was studied at Israeli universities (Bar-Ilan et al., 2003). The major findings indicated that the use of electronic sources was already widespread among the respondents and more than 50 per cent found the electronic services indispensible. Disparities were found between the usage patterns in different disciplines.

Many studies have shown an inverse relationship between e-journal usage and age, but the results indicated that by now, users of all ages have switched to the electronic format not only in terms of usage but also preference. Bar-Ilan and Finka (2005) reported the results of a survey on the use of printed and electronic journals in a science library. The major finding was that more than 80 per cent of the respondents frequently use and prefer an electronic format, irrespective of their rank or age. According to the studies of Kling and McKim (1999) and Tenopir (2003), a user’s discipline and institutional context strongly affect the use of electronic resources.

In China, research on electronic resources has attracted much more interest in academia in the last ten years. Sun et al. (2006) carried out a survey on the use of electronic resources through the websites of Huazhong University of Science and Technology. The result pointed out that the electronic resources should be offered and the operating environment should be customised according to users’ demographics. Beijing University of Technology Library (Li et al., 2005) conducted a sample survey of graduated students and the faculty who have a degree higher than Master’s level. The results revealed that university libraries should be fully aware of the readers’ demands in order to provide good information services. Liang (2007) carried out a questionnaire survey of 600 teachers and students in Dalian Nationalities University concerning the usage of library electronic resources. The results suggested that the users should be supported with more training in order to enhance their information seeking skills while using electronic resources. Min and Yi (2010) report on a number of user surveys that have been undertaken at Tsinghua University in Beijing. It was shown that the users’ expectations of the library are rising and new needs are emerging.

However, most studies about electronic resources in China lack analysis of the factors that have an intimate relationship with the utilisation of electronic resources such as education level, profession and so on. Therefore, this paper seeks to explore the correlation between users’ key demographics (e.g. level of education, profession) and electronic collection use, in order to provide guidelines for electronic library resource providers so that they may improve their services and therefore increase collection use.
3. Methodology
In total, seven 211 Project universities in Wuhan were chosen for the survey. They are:

1. Wuhan University;
2. Huazhong University of Science and Technology;
3. Wuhan Polytechnic University;
4. China University of Geosciences;
5. Huazhong Agricultural University;
6. Huazhong Normal University; and

It can be seen that the chosen establishments cover a range of subject areas including agricultural, business, medical and normal universities and institutes. The main targets of the questionnaire were the university students, teachers, researchers, administrative staff, and doctors in university affiliated hospitals.

In order to find out the users’ demands for electronic resources, the questionnaire was designed to focus on users’ utilisation of electronic resources by demographic identity. The questionnaire included questions about respondents’ basic identifying information (educational level, profession, etc.) and their information requirements.

Before the formal investigation, 50 teachers and students in the School of Information Management at Wuhan University were selected to complete the questionnaire in order to test the validity and reliability of the survey instrument. The results demonstrated that the respondents found the questions clear and the questionnaire was proved to be reasonable and operational. On this basis, the formal questionnaire was put into its final form. A total of 7,000 questionnaires were distributed to the seven universities between October 2007 and February 2008. The survey that was distributed through e-mail was conducted over two rounds where those who did not respond to the first e-mail, were sent a reminder. Ultimately, 3,567 responded, giving a response rate of 51.08 per cent. According to the criteria of valid questionnaires, a total of 1,187 \[ n = 1187 \] were selected. Accordingly, the return rate of the survey was 16.95 per cent. Taking into consideration the fact that the answers were given purely voluntarily and non-incentivised, the return rate can be regarded as reasonable. It may also be assumed that many non-users did not respond.

In order to subject the data to statistical testing, the collected data were coded and analysed using SPSS (originally Statistical Package for the Social Sciences) version 13 for Windows. The data were also tabulated using tables and percentages. The chi-square test was used for the comparison of categorical values.

4. Results and analysis
4.1 Statistics and analysis of the users’ basic information
For the 1,187 valid questionnaires the users were mainly under 45 and there was a fairly even balance between males and females; 97 per cent of the users had a bachelor degree or above, as shown in Table I.

The demographic data collected included age, gender, educational level and broad “job” and indicated that the respondents as a group roughly reflected the parent populations from which they were drawn. Regarding age, the majority of the
respondents were in two groups: 30 and below (43.6 per cent) and 31-40 (44.6 per cent), which were the same as the general distribution of the seven universities. In terms of gender, 47.2 per cent of the respondents were female and 52.8 per cent male. The gender breakdown of the questionnaire respondents was also broadly in line with that of the wider 211 Project student population, which consists of 41.5 per cent female and 58.5 per cent male. As to the education level, 96.7 per cent of the sample had a bachelor degree or above. For jobs, the three largest respondents were: researchers (36.3 per cent), teachers (21.3 per cent) and students (20.9 per cent).

### 4.2 Correlation analysis between users’ jobs and use of NSTL

#### 4.2.1 Correlation analysis between users’ jobs and their purposes of reference search.

Users adopt NSTL mainly for scientific research, teaching, self-development and delegated search. According to the survey, 81.46 per cent of the users search the literature for scientific research, compared with 46.67 per cent who use it for self-development, 33.8 per cent for teaching and only 7.7 per cent for delegated search. The result shows that the great majority of users use NTSL with the aim of doing scientific research, although teaching and self-development also play an important role.

From the correlation analysis between users’ jobs and their reasons for reference search shown in Figure 2, it can be seen that teachers and students search the scientific literature for scientific research purposes, and the secondary reason is for teaching. While the main reason for research personnel, medical staff and administrative staff is the same as for teachers and students, the secondary purpose for them is to practise self-development.
4.2.2 Relationship analysis between users’ jobs and the knowledge service types. The “knowledge service” types of NSTL comprise learning the progress of science and technology, citation retrieval and analysis, statistical analysis, intelligent retrieval, knowledge aggregation and so on. As is shown in Figure 3, learning the progress of science and technology occupies the highest proportion of the knowledge service types (85.4 per cent).

The results of the correlation analysis between users’ jobs and the knowledge service types they need to demonstrate show that there is a relatively higher need for all types among researchers than people with other jobs. While all the users have high demands on understanding the progress in scientific technology, teachers and medical staff have higher demands for the analysis of citation retrieval, and researchers and staff have higher demands on intelligent information retrieval, and the students have higher demands on statistical analysis.
4.3.3 Connection analysis between users’ jobs and the time when they search literature. Through the survey and analysis of the amount of literature that users search in different periods, it is found that users’ requirements of literature are obviously influenced by time, and users from varying backgrounds have different characteristics, as shown in Figure 4. Due to the limited population and speciality of the profession, medical staff and other staff need a relatively smaller amount of literature, and the amount is relatively less influenced by time. Teachers, researchers and students, however, are the main group in need of literature, and their demand varies at different times. For example, as a whole they need less literature in February and August, for February is the time of the winter holiday and the Spring Festival, whereas August is the hottest season in Wuhan. However, their demand reaches the highest in March, September, November and December. Demand for literature reaches a climax in March because it is the critical period for graduate paper writing. From the beginning of April, with graduates’ demand diving rapidly and the pressure of term examinations increasing greatly, the demand for literature by students as a group keeps dropping until September when the inflow of new students brings about a gradual overall rise. Teachers and researchers as a group, resemble that of the students in terms of literature demand, only with a smaller variety.

5. Discussion
The results from this study show that NSTL user groups in the sample survey have distinct characteristics. First, the vast majority of user groups have received a high level of education. Over 50 per cent of users have received postgraduate education or above, as the majority of NSTL users are graduate students and young staff members. This is consistent with the studies by Dilek-Kayaoglu (2008) and Jiao et al. (2009). Second, the quantity of male users slightly surpasses female users. This result is similar to the findings of Bar-Ilan et al. (2003).

Li et al. (2005), Sun et al. (2006) and Liang (2007) investigated the characteristics of the users’ age and gender, as the barriers to using electronic resources for Chinese students. However, the relationships between these characteristics are not clear.
Dilek-Kayaoglu (2008) analysed the relationship between the factors of age, frequency of using electronic journals, barriers of subscription and place of access. Borrego et al. (2007) made correlation analyses of the users’ age, gender, as the reasons and purposes of using electronic resources. Based on the previous studies, this research mainly explores the relationship between the users’ educational backgrounds, including profession and academic level and their use behaviour. This research surveys the users of the one electronic resource product, whereas the other surveys investigate the users of several ones.

The findings from this research are:

- **Users’ jobs correlate with the literature services they need.** The correlation analysis between users’ jobs and their reasons for searching the literature shows the main purposes for teachers, students, administrative staff, researchers, and medical staff to use NSTL is for scientific research, teaching and self-development. For teachers and researchers, there is not only the need for scientific research and teaching but also for self-development, which is in accordance with the characteristics of their profession. So electronic resource providers should offer customised literature services in response to users’ professions, thus satisfying their needs in a more worthwhile manner.

- **Users’ jobs correlate with the knowledge service types.** The connection analysis between users’ jobs and their need for knowledge service types shows that there is a relatively high demand for all the knowledge service types including learning about the progress of science and technology, citation retrieval and analysis, statistical analysis, intelligent retrieval, knowledge aggregation, and so on among researchers, followed by teachers and students. NSTL should target researchers, teachers and students as key user groups, developing new service products so as to keep the customer groups stable. At the same time, some personalised products should be launched for users from other backgrounds, thus meeting the needs of users within various fields.

- **Users’ jobs correlate with the time in which they search.** The relationship analysis between users’ jobs and the time when they carry out searches shows that the demand for literature obviously varies over time, showing a certain degree of regularity. The needs of teachers, researchers and students are greatly influenced by time so it is recommended that the factor of time be considered by electronic resource providers during publicity, that is choosing the publicity time in the months when there is greatest demand. When it comes to publicity among university users, the suggested time is in March, September, October and November. At the trough, or low usage period of user need, product providers are advised to run maintenance, upgrades and so on.

6. Conclusions and recommendations
Through the questionnaire survey of NSTL users, their basic information, demand characteristics and behaviour for accessing information has been examined. Through the correlation analysis between users’ educational level, profession and the information services they need, the characteristics of information behaviour during their use of electronic resources has been found. The results of the survey further define the main targets that libraries and electronic resource providers serve, which
contribute to the determination of the target user groups on which development needs to focus and is of guiding significance in identifying potential users. Users’ demand varies greatly due to the difference in age, education level, profession, and so on. NSTL should make personalised publicity plans and provide training for users. Moreover, they should launch new service products, expand the service content and improve the service quality according to users’ different information needs. This provides the libraries with a reference to identify the target users accurately and appropriately. Furthermore, it is helpful for libraries to improve the service quality, bring the value of resources into play, and deal with the fast changes in the information environment, in order to ensure their survival and development. In addition, it can lay a theoretical and practical foundation for the construction of electronic resources in university libraries.

Based on the findings of the paper, further research work is needed to expand the scope of the survey and perform some empirical studies on the content of the survey. By this research, the characteristics of electronic resource users’ information behaviour can be defined and a reference can be provided for the construction of electronic resources in libraries and the operation of electronic resource providers.

References


**Further reading**


**Corresponding author**

Liyi Zhang can be contacted at: lyzhang@whu.edu.cn

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