The Usability Evaluation of the Website of the National Library of China

A study submitted in partial fulfilment of the requirements for the degree of Master of Digital Library Management

at

THE UNIVERSITY OF SHEFFIELD

by

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Abstract

Background

The usability studies of library website are stared very late in China and the relative usability evaluation researches are not enough. The National Library of China as the third largest national library in the world to provide various services to general public and the website represent the development of the currently digital library in China. Thus it has important value in academic research.

Aim

The aim of this dissertation is to establish the usability evaluation of the website of the NLC, and it is based on the evaluation to generate recommendations to optimize the website and provide better user services.

Sample

The study involved 10 students in Sheffield University and 3 employees who are working in China. Their native language is Chinese and their knowledge and skills could support them to finish basic computer operations.

Methods

The approach of all the interviews is one-to-one activity. Student interviewees were conducted face to face interview in in the enclosed room without outside interference, and employees were conducted online interview by instant messaging software which has voice chat and sharing screen function. Participants were asked to finish 3 tasks and answer 22 questions. The process of interviews was recorded by notes, voice recorder and screen recorder software.
Results

The results show that most participants can be fast and easy to complete common operations and tasks, and the evaluation reflects the good qualities includes learnability, usefulness, content richness and consumer service are exist. However, the aspects such as content subject, visual design and website speed have some disadvantages which made negative influence to user experience.

Conclusion

It is concluding that the usability of NLC website is normal extent; all the research objectives were achieved during research process. The research model is not perfect, more scientifically sample recruitment and more detailed task and question design would be desirable. Further studies could focus on how to attract potential users become regular user.
Acknowledgement

I would like to express my gratitude to my supervisor Peter Willett, a respectable, responsible and erudite professor. He was patient during the discussion of my study, gave me effective advices and kindness encouragement. Without his helps I could not finish my dissertation.

Furthermore, I want to thank my classmates and friends, they not only willing to become interviewees in the research without any benefits, but also gave me a lot of support in my life.
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1 Introduction

1.1 Background

As the third largest national library in the world, the National Library of China (NLC) has more than 35 million collections; the main elements include literature information collection, processing, management, preservation, utilization, research and dissemination. The NLC provides services to government department, social organizations and the general public. It plays an important role in supporting the advanced traditional Chinese culture and promoting the construction of public cultural service system (NLC, 2015). NLC represent the development of the Librarianship in China, the currently running website is the ninth edition of the NLC, which was release in September 2008. This version of the website was design for the National Digital Library opening (Song, Zhang, Li, 2011). The usability research of library website in China has undergone the transition from theory to practice, from emphasis on the library website usability issues to focus on the library website usability evaluation studies (LI, 2010). Due to the late start of usability studies; there are limitations in the field of usability evaluation. Innovation conception, empirical research and the model and framework of usability evaluation based on user viewpoint are not considered sufficient.

The library websites consist of a back-end and a front-end. The staff manage the back–end, which includes database, server, background management system, software and other functionality to support the website running. The front-end of website is the user interface, the interface can access when they use the website (George, 2008). In order to help user access information and resources from digital library more easily and fast, the design of user interface of library website is considered important. Usability is the primary standard for website design, if users think the website is difficult to use, they may quickly leave it (McKinney & Zahedi, 2002).
This study adopts the method of interviewing to investigate the usability of the NLC website. The simple understanding of Usability is ease-of-use and usefulness, with the development of usability study, the quality criteria gradually increased, the key components includes effectiveness, efficiency, satisfaction, learnability, memorability and error (Hartson, 1998; ISO9241-11, 1998; Nielsen, 2012). In additional, many institutions and experts have published guides or tools for website evaluation, such as Microsoft Usability Guideline (MUG), Questionnaire for User Interaction Satisfaction (QUIS) and System Usability scale (SUS). Combined with these concepts and the characteristics of the NLC website, I set the evaluation criteria as learnability, efficiency and usefulness, satisfaction, website content, error and consumer service.

1.2 Aims and objectives

The primary aim of this dissertation is to establish the usability evaluation of the website of the NLC, and then based on the evaluation to generate recommendations to optimize the website and provide better user services. In addition, the researcher want to obtain employment in the library field, and therefore the increasing information and knowledge about the NLC in the research process would be helpful for the future career.

In order to realize the above aims, the following 5 research objectives will be examined in the study;

1) To observe and record users searching and browsing behaviours for analysing their performance.
2) To investigate their feeling and attitude to the NLC website.
3) To find existent errors of the website in the using process.
4) To sum up the advantages and disadvantages of the NLC in the usability aspect.
5) To understand the user expectation to the NLC website.
1.3 Dissertation structure

This dissertation has six chapters, which includes the introduction, literature review, methodology, result, discussion and conclusion. The introduction chapter states the context of usability and the NLC website, and described the aims and objectives of the study. In the chapter of literature review, the relative theoretical and practical findings in the previous usability studies have been presented and compared. The Methodology chapter describes the selection of sample and interview design, and the main research approaches for the data collection and analysis. In the chapter of result, task performance and participants’ perspectives have been showed. Chapter five based on 6 criteria to discuss the result of the evaluation. The final chapter summarized the findings and points to make conclusion, recommendations and limitations.
2. Literature review

2.1 The conception of Usability

The studies of usability originate from the human-computer interaction (HCI) and ergonomics field. In the 1980s, usability studies focused on the better interactive system design to improve operational efficiency, such as how to save time and reduce errors, and how to improve keying performance (Smith and Mosier, 1986). Since usability has been introduced into the research of cognitive psychology, library and information science, anthropology and other related fields, it has gradually developed into an interdisciplinary research area (Chowdhury, Landoni, Gibb, 2006). The integration of theoretical and research perspectives for different disciplines, and the expansion of the application scope, leads to different meanings, dimensions, models and evaluation methods of usability. The concept of usability shows pluralism and fuzzy boundaries characteristics (Lee & Kozar, 2012).

For the usability concept, researchers have proposed a variety of definitions. Hartson pointed out the usability contains two meanings: usefulness and ease of use, usefulness refers to whether the product can achieve a range of functionality; ease of use means interactive efficiency, learnability and user satisfaction (Hartson, 1998). The perspective of Hartson is straightforward, but it lacks further analysis about how to use these two criteria.

The more common definition of usability is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”, which was given by the International Standards Organization (ISO9241-11, 1998). The word of “effectiveness” refers to the accuracy and completeness while the user accomplishes specific tasks and achieves specific goals; "efficiency" represents the resources consumed (such as time) for user to realise the target; “satisfaction” is the comfort and acceptability of the user in the process of using the product. Obviously, the usability definition of ISO has a task-oriented character and concern with the assessment of the user interface. Many researchers agree with this user-centre concept, and definitions of more obvious user orientation have emerged. Dickstein and Mills (2000) consider usability as a property of helping users successfully learn and use a system to
accomplish the assignment; Venkatesh and Agarwal (2006) defined usability as the extent of effectiveness, efficiency and satisfaction of users to complete the specified goals; these viewpoints could be treated as the continuation of the user-centre concept.

According to usability consultant Jakob Nielsen (2012), usability includes the following factors:

1) Learnability: In first meeting the design, how easily can the user understand the basic operation?
2) Efficiency: How fast can the user complete specific tasks?
3) Memorability: If user does not use the design for a period of time, how easily can user re-establish mastery?
4) Error: The frequency and severity of errors.
5) Satisfaction: How satisfied is user when using the design.

The Nielsen definition includes five specific measurable criteria, which lay the theoretical foundation for the usability evaluation model; therefore it is widely used in usability studies.

2.2 Website usability research

As the World-Wide-Web has occupied a core position in the information age, researchers have introduced usability research into the web environment. Generally, the concept of website usability is derived from the broader usability concepts in the subject of HCI (Shneiderman, 2014). Preece agrees with Nielsen’s usability definition; he believes website usability is how easily and intuitive by individual users learn to interact with a site to complete a task, and also refers to the quality of the website appearance perceived by the user: easy to learn, easy to remember, easy to use (John &Bass, 2001). Shneiderman (2014) pointed out the essence of website usability is to keep the balance between the functionality and complexity. Functional deficiency will lead to a site being unavailable, and the site is too complicated it will be difficult to use.

The necessity of website usability has been an emphasis of usability studies. Nielsen (2003) suggests organizations should spend 10% of their budget for system development on usability evaluation, He investigated 42 institutions which applied
usability evaluation methods to redesign their websites, and found that the usability evaluation increased traffic by 150%; sales conversion rate increased 135%. He noted that for commercial sites, to meet the needs of consumers is more important than to attract or please them; if consumers find the site is too difficult to use, they will not purchase goods or visit the site again. McKinney and Zahedi (2002) have a similar perspective, they believe that retrieving the required information is very difficult on a website; they will abandon the site, even if the site indeed provides users required information to complete the task. Additionally, the website usability also affects the user impression of the merchandise on the site.

It is very easy for user to switch sites in the open network environment; sites should meet the requirements of usability in order to ensure users continue using the site. Research shows that the nice usability such as a positive interaction and a lower error rate, which give user an impression of customer first and service priority; it has a positive impact on user behaviour (Casalo´ et al., 2007).

Because of the increasing internet fraud and privacy leak problem, without enough evidence and signal, user cannot believe they are in a safe web environment and make sure their privacy and security under safeguard. Website usability can present the ability, efficiency, credibility and integrity of the institution (Belanche et al., 2012). Website usability enable help user to decrease uncertainty and worry, when they consider the operation might related to the risk.

In the preview research, many scholars and organizations have developed a series of guide and tools. As the standard questionnaire, the questionnaire for user satisfaction (QUIS) and system usability scale (SUS) are widely used in studies. QUIS was designed by a multi-disciplinary researcher’s team at the University of Maryland, it used to collect data of users' subjective satisfaction of the human-computer interface. The last version 7.0 has 9 measuring factors, such as screen factor, terminology and system feedback, learning factors, system capabilities and software installation (Norman et al., 2011). SUS is a ten-item questionnaire with Likert – Scale five response options; which was designed by John Brooke (Brooke, 1996). It is a useful and reliable tool to measure user’s view of subjective evaluation of usability. Besides, Microsoft also published a guideline of websites usability evaluation, which categorize content, ease of use, promotion, made-for-the-medium, and emotion these
factors. Venkatesh and Agarwal (2006) based on these five usability factors in Microsoft Usability Guideline (MUG) to design the usability model in their research.

2.3 The usability of digital Libraries

Since Fox and others have raised the usability issues of digital libraries, the usability of digital library evaluation has become an important area of research. HCI, the usability of digital Libraries are highly interrelated with HCI, which is the traditional field of usability studies. HCI usability studies first focus on system-centred research. Usability experts Nielsen, Hix and Hartson all focus on user interface, the system interface visualization, system performance (Chowdhury et al., 2006).

System-centred usability is the basis of usability studies of digital libraries, Fox (1993) pointed out that the usability evaluation of digital libraries relates to representation, architecture, and user interface. Shneiderman (2014) in his study noted the establishment of application guidelines for interface usability. According to these guidelines, the system should keep a consistent style; offer shortcuts to skilled users; provide suitable feedback about source and closure; simplify error rectification and action withdrawal; allow users control; and offer substitute interfaces to expert and novice users. McMullen (2001) in the usability testing of the Williams University library website, mentioned design issues of user interface in the site, such as the colour scheme, size of text and image, navigation link position and the necessity of context sensitive help. Buchanan (2009) considers the usability of digital Libraries includes effectiveness, efficiency, attractive interface, clear navigation, easy of learning, simple terminology and other factors. These studies emphasize designing better interfaces to improve the efficiency and effectiveness of digital libraries.

Human-computer interaction has gradually developed in the user-oriented direction, and the goal of usability research has changed from making user enable adapt technology development to making the technology and ability to adapt the needs of users. User-centred research emphasizes the understanding of user cognitional and psychological need, preference, and these factor how to make influence on information searching behaviour and information using process (Ferreira & Pithan,
George (2008) agree with the usability of digital libraries refers to the ease and effectiveness of the user to find the required information in a digital library, and designers and developers should pay more attention to know the behaviours and preference of users.

Usability evaluation of Digital Libraries has both diversity and flexibility. The evaluation methods and purposes have different emphases, but they are inseparable from the effectiveness, efficiency and user satisfaction and other key factors. Evaluation methods and procedures include experimentation, information systems evaluation and combine with traditional library evaluation. Saracevic (2005) summarizes three useful sets of criteria for digital library evaluation: the traditional library criteria, which consist of collections, information, use and standards; traditional information retrieval standard include interdependency, satisfaction, index, result; traditional human-computer interaction or interface standard related to functionality, navigation, error, skimming, layout and service.

Usability evaluation of digital libraries adopts various methods, such as focus group, questionnaire, card sort, paper prototyping, Heuristic evaluation, category membership exception, web log analysis and interview (Chowdhury et al., 2006). The questionnaire is the basic method of usability evaluation, this method enable quantize measurement results, but it is difficult to find the problems out of questionnaires. Focus groups are usually used to obtain specific comments. Researchers first provide the question about the digital library usability problems, and then group members start to discuss. During the discussion, researchers should guide and record process, to obtain a variety of specific views and opinions (Einaasto, 2014). Interview involves researchers or experts discussing a particular topic of conversation with interviewees, in order to obtain their feelings and thoughts. Using focus groups and interview, researcher can obtain the views and opinions from various types of person. This can help expand research horizons and looking for meaningful research directions. However, these two methods also have their downsides; they mainly collect qualitative data, and the results analysis and interpretation may be affected by subjective factors.

Jahn (2008) believes that focus group is suitable for the low funds or time-limited project. The number of participant should not too less; otherwise it will affect the
reliability of result. Questionnaires are widely used in digital Library usability evaluation, but researchers and participants might have different interpretations of questions and answers. Web log analysis can record the actual interactions operation by digital library users to accomplish specific tasks, but it cannot reflect motivation of interaction.

In order to obtain satisfactory results, many researchers combine a variety of methods to make usability assessment. Mara and Nunes (2005) published their usability evaluation report of the InfoHab digital library. They applied personal interviews, library model, direct observation, video recording and other methods to obtain data from six different academic background and experience users. The study adopts the Nilsen usability criteria, which include learnability, efficiency, error, memorability and satisfaction. The study combines the theoretic of Information Science and Human Computer Interaction as the basis of the usability of digital library evaluation, and proved the consistency of IS and HCI by empirical study.

The usability evaluation of digital library was developed relatively late in China. The first research paper appeared in 2000, and the related studies became active after 2007 (Ma & Cao, 2014). This research mainly related to the general theory and special studies, for instance digital Library usability studies review, information architecture and interface usability studies, the usability of virtual reference services, the usability study based on Information Science method, the usability criteria (Li, 2010). Zhao (2007) choose Shanghai Library website as research object, and connected with the usability problems exists in the process of information architecture of large-scale public library website; try to establish a set of evaluation system for public library websites. Zhu and Li (2015) applied interface content, website structure, page layout, human-computer interaction, network performance these 5 categories to establish usability evaluation system, and handout questionnaires to users to make the evaluation and analysis of 8 academic library website in China.

Chinese scholars tend to focus on applying theory to practice, empirical evaluation studies carried out in major public libraries and academic libraries. The trend of usability studies of the digital library is increasing. However, empirical research has
not been fully developed in this area, and thus usability evaluation of digital library in China need to further expanded and studied.

2.4 Summary

This chapter presented the relative theoretical and practical findings in the previous usability studies. It was found that learnability, efficiency, usefulness, error, satisfaction, content are important factors of website usability, which are common used in usability studies by researchers. And qualitative researches were generally adopted in usability studies. The goal of usability research is make the system or interface design more suitable for users and the website usability evaluation should base on users’ opinions and perspectives.
3. Methodology

3.1 Methodological approaches

The general methodological approaches are divided into quantitative research and qualitative research. Quantitative research uses statistical, mathematical, computational techniques and other methods to carry out scientific empirical study of phenomena (Given, 2008). Many scholars agree that the theoretical basis of quantitative research come from Auguste Comte's positivist framework (Kasim, Alexander, Hudson, 2010). Expanding and applying mathematical models, theories and hypotheses about social phenomena is the goal of quantitative research. In quantitative study, the most important process is measuring, because this process is a fundamental link to the phenomenon of "empirical observation" and "mathematical representation."

According to Denzin and Lincoln (2011) qualitative research is a common method used in the field of social science and education. It actually not a single method, but refers to a number of different research methods which do not belong to quantitative research. Qualitative research includes but not limited to phenomenography, action research, case study and interview (Bogdan & Taylor, 1990). Qualitative research investigates the reasons and methods of human decision-making, not just emphasizes what decisions people make, when and where they make a decision. The purpose of qualitative research is to reach a deeper understanding of human behaviors.

Qualitative research is suitable to collect data in this project. First, quantitative research is based on exploration and prediction; it aims to verify an assumption. However, the conclusion of this research is unknown in the beginning; the researcher needs to collect and analyze data to obtain results. Secondly, it is hard to maintain the demand of collecting a large number of samples. Compared with quantitative research, qualitative research focuses on smaller but more concentrated samples to produce information or knowledge about a particular case study. This study primarily adopts qualitative research but also combines with quantitative methods to
analysis data, because data can be presented by statistics, percentages and other forms, that improve the intelligibility of result, and make it is clear and unambiguous.

3.2. Research design

Jalil (2013) describes research design as necessary to ensure successful data collection and analysis; it should consider all kind of details to avoid wasting time and resource. The research aims to establish usability evaluation of the website of the National Library of China (NLC). In order to obtain credible and relevant data, this study selected interview as the main investigative methods. Interview is often used in academic research and market research surveys, which is conducted to reveal the potential motives, beliefs, attitudes and feelings from interviewees (Jamshed, 2014).

3.2.1 Sample

Sample is an important part of interview, choosing suitable group as interviewee is benefit to collect useful and relevant data (Kvale, 2007). The research purposes determine the target participants should fit these provisions. Firstly, The interviewees should be people whose mother tongue is Chinese, even the NLC website provides English version, but the most contents and pages still are wrote by Chinese. Secondly, they need have essential acknowledges and skills to finish basic computer operations, such as searching, visiting website and using email.

The diversity of sample is benefit to get various points of views and phenomenon from the empirical materials (Flick, 2007). At first, the major interviewee group just limited to Chinese students are learning different courses in Sheffield university. In order to keep the sample diversity, 3 participants were selected from different occupation, they are work in different industry in China were invited as new participants.

At first, I contacted acquaintances to participate my survey. Then, I asked them to introduce their classmates or friends who fit the provisions of participant; I sent email and message to invite these people. The duration of interview approximately is 20-30 minutes, for reasonable coordinated and assigned every participant time, and
ensure interviewer have enough time and energy to complete data collecting, setting the amount of participants as 13.

3.2.2 Interview

Interview forms include structured, semi-structured and unstructured; structured interview was adopted, because it can be performed conveniently and quickly, and easy to analyses data (Gubrium et al., 2012). Interview conducted as one-to-one activity, the schedule contains two parts, one part is asking participant to complete 3 tasks, and the other part is participants answer predefined questions. Consideration of most participants never use the website of NLC before the research and some users has long time do not visited; if they do not built a basic cognition with the website of NLC, they cannot answer questions (George, 2008). Thus, the first task is browsing and familiar the website, in the process, participants can understand what is the website, what functions and services does the website provide, what can they do in the website. Information retrieval is an important evaluation factor of digital library website, Swe (2011) considers “digital library is a type of information retrieval system”. The second task is information retrieval, interviewees were asked to search resource by the “Wenjin” search, which is the information retrieval system of the website, the keywords and topics could be anything they are interested in. When the results come out, they need to answer a series of questions and to finish the following steps.

Supportability refers to website how to provide information and support to enhance the use experience; which relate to accessibility of service, e-mail service, reply to customer, contact information, and intuitive online help; it is significantly affect customer experience (Lee & Kozar, 2012). The third task aim to investigate the supportability of the website, interviewees were demanded come back to the homepage to look for consumer service information and select the suitable methods. Every task does not have a time limit; participants could work on the task until they think have finished the task or want to give up.

Interview consist of 3 tasks and 22 open or closed questions, and answer question and complete task these two parts were crossed in the process. Based on the Nielsen
and other experts usability researches, interview questions and tasks design were focus on learnability, efficiency and usefulness, satisfaction, website content, error and consumer service these criteria, and makes reference from QUIS and SUS. Question 1-3 aim to get participant demographics data(Appendix 8.2); question 4, 5,6,14, 21 used to investigate efficiency and usefulness(Appendix 8.2); question 7, 8, 10,11,12,13 are related to learnability(Appendix 8.2); question15, 16 are about satisfaction(Appendix 8.2); question 9 is related to consumer service(Appendix 8.2); website content was considered in design question 18, 19, 20(Appendix 8.2). According to my supervisor’ recommendation, 5-part Likert scale (strongly disagree / disagree / neutral / agree / strongly agree) was set for closed questions to get specific responses.

Data collection started from July 21th 2016 and ended in July 31th 2016, which divide into face to face interview and online interview, face to face interviews were conducted in the booked group room in the diamond library or information school in the University of Sheffield. When participant arrived and sit down, I firstly gave participant the printed consent form, demographic information sheet and pen, participant needed to read and fill out these documents. Then, participant was asked to complete a series of tasks in the website of NLC, and answer pertinent questions. I observed their behaviors and talked answer with them to gather more detailed information about interviewees’ opinions, attitudes, experience and expectation of the website.

Online interview was designed for participants are not at Sheffield, consent form and information sheet sent by email in advance, interviewee should printed and fill in it, and sent the scanning copy or photocopy back. We communicated by “Tencent QQ”, an instant messaging software provide voice chat and other services, participant used the sharing screen function of the application, so that I can watched participant how to finish the tasks.

In order to avoid missing any data and research details, except took notes on the paper, I also used the “voice memos” of iPhone to record the conversation in the interview session. Besides, the free online screen recorder software named “Apowersoft” was used to record the participant computer operations.
Pilot is very useful to test the feasibility of research scenario, modify the mistakes and avoid the risk might appear in the research (Salkind, 2010). The pilot aims to check the rationality of questions, practicability of tasks and consistency of the process, and ensure participants can understand the questions and tasks, and enable to give reply and know how to carry out. I hold two pilots, first one is online interview, and second one is face to face interview. The first pilot make me found some technical problems, such as the poor network speed lead to the interview had to suspend; the initial selected screen record software did not work. The second pilot carried out smoothly, except a few questions result in misunderstanding. Review these two pilots, I modified some words to make the question more intelligible; selected the suitable software for communication and recording, and chosen the more stable internet.

3.3 Ethical aspects

This is a low risk research and has been approved by the information school, the university of Sheffield, the Research Ethic Approval letter and the ethic form are show in the appendix. All interviewee in the survey are adult, the information and data collecting must get their permission. They have right to reject answer any questions or stop interview at any time. The survey result just for academic research, the personal information would not public.

3.4 Data analysis

As interview consist of task and question two parts, data analysis also can divide into task performance and participants perspectives.

In the Task performance part, through watching the videos of screen recording, marked the start and end time to count the task durations, and note down search result amount and participants operation steps or schedule. Type figures into Microsoft Office Excel to generate pie charts or bar charts, comparing two participant groups’ the average time spent on task.
In the part of participant perspectives, repeat listening the voice recordings to write interview transcription and sort out answer for each question. Calculate the score of 5-part Likert scale questions, question 9 and 13 are ask negative side, so the score need to oppositely calculate, 5 points treat as 1 point, 2 points treat as 4 points. After get all score, then type figures into Microsoft Office Excel to generate pie charts or bar chart. Synthesis and categorize the opinions and answer of participants, and presented these text in detailed tables.
## 4. Result

Table 1. Demographics of participants (The total amount is 13).

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>3</td>
</tr>
<tr>
<td>Education background</td>
<td>Master</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Undergraduate</td>
<td>2</td>
</tr>
<tr>
<td>Occupation</td>
<td>Students</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Working</td>
<td>3</td>
</tr>
<tr>
<td>Living location</td>
<td>UK(Sheffield)</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>3</td>
</tr>
<tr>
<td>Website visiting history</td>
<td>Never used before</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Irregular</td>
<td>4</td>
</tr>
<tr>
<td>Age</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 2. The last visiting time of the group of user participants

<table>
<thead>
<tr>
<th>User</th>
<th>The last visiting time</th>
</tr>
</thead>
<tbody>
<tr>
<td>p8</td>
<td>One year ago</td>
</tr>
<tr>
<td>p9</td>
<td>One year ago</td>
</tr>
<tr>
<td>p10</td>
<td>One month ago</td>
</tr>
<tr>
<td>p11</td>
<td>Five years ago</td>
</tr>
<tr>
<td>p12</td>
<td>One year ago</td>
</tr>
</tbody>
</table>

Figure 1. The mean interview duration of female, male and all interviewees (unit: minute)
Figure 2. The spent time in task-1 (browsing and familiarizing the website) of each participant (unit: second)

Figure 3. The average time of novice participants and user participants spent in task-1 (browsing and familiarizing the website)

(“P” is the abbreviation of participants; each participant was coded by number)
Table 3. The results amount of “WenJin” search and participant responses

<table>
<thead>
<tr>
<th>Participant</th>
<th>Results amount</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>3,600</td>
<td>Satisfied, many relevant resource</td>
</tr>
<tr>
<td>P2</td>
<td>5,300</td>
<td>Satisfied, could find wanted resource</td>
</tr>
<tr>
<td>P5</td>
<td>63,000</td>
<td>Satisfied, many relevant resource</td>
</tr>
<tr>
<td>P6</td>
<td>230,000</td>
<td>Satisfied, at first showed less relevant information, but using search tools and skills can find more related information.</td>
</tr>
<tr>
<td>P7</td>
<td>1,200</td>
<td>Satisfied, many relevant resource</td>
</tr>
<tr>
<td>P8</td>
<td>28,000</td>
<td>Satisfied, many relevant resource</td>
</tr>
<tr>
<td>P9</td>
<td>6,300</td>
<td>Satisfied, could find wanted resource</td>
</tr>
<tr>
<td>P10</td>
<td>780</td>
<td>Satisfied, many relevant resource</td>
</tr>
<tr>
<td>P12</td>
<td>48</td>
<td>Satisfied, could find wanted resource</td>
</tr>
<tr>
<td>P11</td>
<td>5,100</td>
<td>Not bad, could find relevant resource</td>
</tr>
<tr>
<td>P3</td>
<td>21,000</td>
<td>Unsatisfied, less relevant information</td>
</tr>
<tr>
<td>P4</td>
<td>6,700</td>
<td>Unsatisfied, no relevant information</td>
</tr>
<tr>
<td>P13</td>
<td>200</td>
<td>Unsatisfied, less relevant information</td>
</tr>
</tbody>
</table>
Figure 4. Participants' attitudes to the search result

Figure 5. The first choice of participants to obtain more accurate results
Figure 6. The most useful search method selected by interviewees

![Pie chart showing the most useful search method selected by interviewees.]

- Narrow the scope of search, 21%
- Changing search words, 14%
- Refine specified resource type, 64%

Figure 7. Participants’ attitude to the user registration

![Bar chart showing participants’ attitude to user registration.]

- Registration steps are too much: 4 Agree, 9 Disagree
- Sensitive to provide real personal information: 4 Agree, 9 Disagree
<table>
<thead>
<tr>
<th>Participant</th>
<th>The process to access resources</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Step1. The page was loaded 8 seconds</td>
<td>Step2. A pop-up window noted: You do not have permission to access the resource, if you want to know more information about permissions, please see the help; click OK will automatically links to the help page.</td>
</tr>
<tr>
<td>03</td>
<td>Step1. The page was load 20 seconds, and then linked to the resource page; clicked “online reading” again and waited 8 seconds</td>
<td>Step 3. Clicked “ok”, the page showed “404 not found”.</td>
</tr>
<tr>
<td>13</td>
<td>Step1. Clicked “online reading” many times, totally no response.</td>
<td>Failure</td>
</tr>
<tr>
<td>10</td>
<td>Step1. Clicked “online reading” many times, totally no response.</td>
<td>Step2. Chose another result, clicked “online reading” again, stills no response.</td>
</tr>
<tr>
<td>12</td>
<td>Step1. The page was loaded 10 seconds, and then linked to resource page, clicked “online reading” again and waited 6 seconds.</td>
<td>Step2. The page reminded “This plugin is vulnerable and should be updated - Activate adobe flash”</td>
</tr>
<tr>
<td>02</td>
<td>Step1. The page was loaded 10 seconds, and then linked to resource page, clicked “online reading” again and waited 6 seconds.</td>
<td>Step3. Updated Activate adobe flash plugin, the page was loaded 24 seconds.</td>
</tr>
<tr>
<td>07</td>
<td>Step1. The page was loaded 48 seconds.</td>
<td>The content pages were successful presented.</td>
</tr>
<tr>
<td>08</td>
<td>Step1. The page was loaded 60 seconds.</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Step1. The page was loaded 8 seconds, and then linked to resource page, clicked “online reading” again and waited 23 seconds</td>
<td>Step2. Left the page alone, and continue following interview, after 40 seconds came back to the page.</td>
</tr>
</tbody>
</table>
Figure 8. Participants’ choices of customer services at the beginning (some participants only have one choice)

Figure 9. Participants’ choices of customer services when they have known all contact information
Figure 10. The distribution of participants evaluation to different criteria (Score range from 1 to 5)

Figure 11. The comparison of each score of different criteria (Full score is 65)
Table 5  Participants perspectives of the wording and the language intelligibility of the NLC websites

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Which words or text make you feel confused?)</td>
<td></td>
</tr>
<tr>
<td>• Most of language is clear.</td>
<td>• “WenJin search” is ambiguous; do not know it means searching digital resource or physical book?</td>
</tr>
<tr>
<td>• The language is very clear, no ambiguous words.</td>
<td>• What the meaning of “Microform”? It looks like similar with “Audio Visuals”, what difference between these two categories?</td>
</tr>
<tr>
<td></td>
<td>• Feel confused about “Science and technology novelty search” and “thesis collection and reference”.</td>
</tr>
<tr>
<td></td>
<td>• Have misunderstanding with the words of “digital library”.</td>
</tr>
<tr>
<td></td>
<td>• The language is too official and academic, which is hard to well comprehend, especially the classification titles of top navigation bar.</td>
</tr>
</tbody>
</table>
Table 6  Participants perspectives of the classification and operation of the NLC websites

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The default setting is clicking the left mouse button would open link in new tab rather than links to new page in the same tab, do not need click many times to come back previous pages.</td>
<td>• The “last announcement” always appeared in the lower right corner of page, it is annoying.</td>
</tr>
<tr>
<td>• The website is very easy to use.</td>
<td>• The classification of search box in the homepage is confusing, especially the drop-down menu of search box. Not sure the “library catalogue” whether belongs to “Wenjin search”; and “specialized resource” should not put in drop-down menu.</td>
</tr>
<tr>
<td>• The website layout is clearly.</td>
<td>• The classification is a bit academic, normal users are hard to understand the resource categories of “Microform”, it might need annotates.</td>
</tr>
<tr>
<td></td>
<td>• Some information or link in homepage is repeated and redundancy. Besides, participant needs to drag down the scroll bar to see the resource navigation.</td>
</tr>
<tr>
<td></td>
<td>• A lot of useful functions and services is hard to noticed, such as “Full text available” and “online consultation desk”.</td>
</tr>
</tbody>
</table>
Table 7  Participants perspectives of the NLC website navigation

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The navigation and classification are clear and accurate.</td>
<td>• It is a bit too simple and less.</td>
</tr>
<tr>
<td>• The navigation and classification are simple, not complex.</td>
<td>• The user do not use this website regularly might feel confused about navigation and classification.</td>
</tr>
<tr>
<td></td>
<td>• The top navigation bar do not need to show the date and time.</td>
</tr>
<tr>
<td></td>
<td>• Do not understand why “Book” and “Ancient books “are divide into two categories.</td>
</tr>
<tr>
<td></td>
<td>• The navigation needs to be improved.</td>
</tr>
</tbody>
</table>

Figure 12. Participants’ response of “Can you quickly find the required information in the website?”

Can you quickly find the required information in the website

- Yes: 85%
- No: 15%
<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The simple and succinct style would not dazzle the eyes.</td>
<td>• The layout is not good, the website looks like naive and out of date; it should be more modern and creative.</td>
</tr>
<tr>
<td>• The colour matching is good.</td>
<td>• The Visual design is too simple.</td>
</tr>
<tr>
<td>• The website visual design looks nice.</td>
<td>• The two banners in the homepage left and right sides and the last announcement in the lower right corner all looks terrible, which obscured sight and interrupted reading.</td>
</tr>
<tr>
<td>• The style of “Wenjin” search page is concise and classical.</td>
<td>• Colour matching is not coordinated, the whole visual style of website is disunity, the search box used square corner, however the background used round corner.</td>
</tr>
<tr>
<td>• The image slider in the homepage is beautiful.</td>
<td>• It looks like out of date, colour matching is terrible, slides and icons are strange.</td>
</tr>
<tr>
<td>• The style of open course page is concise and unaffected.</td>
<td>• The visual style is unprofessional and unmodern, which is not suitable for a national library website; the visual design should combine with fashion and classicalism. The two banners in the homepage left and right sides looks like cheap advertisements.</td>
</tr>
<tr>
<td></td>
<td>• Colour matching and icons are ugly.</td>
</tr>
</tbody>
</table>
Table 9. Participants’ perspectives of the NLC website speed

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
</table>
| The website speed is fast. | • The loading of online reading is slow  
• The loading of online reading is slow, maybe due to the internet speed or location reason  
• The search result loading time is too long.  
• The online resource loading time is long, the steps to access the resource is too many.  
• Open the NLC website waited very long time, more than 8 minutes. |

Figure 13  Participants opinions of the NLC website whether can provide useful information/help

This website can provide me useful information/help

- Strongly agree, 57%  
- Agree, 14%  
- Normal, 14%  
- Disagree, 14%
Table 10. Participants perspectives of website content

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study:</td>
<td>● The English literature is too less.</td>
</tr>
<tr>
<td>● Provide a rich academic catalogue and</td>
<td>● Not all of the professional resource is available.</td>
</tr>
<tr>
<td>resources.</td>
<td></td>
</tr>
<tr>
<td>● Specific Chinese literature</td>
<td></td>
</tr>
<tr>
<td>Life:</td>
<td></td>
</tr>
<tr>
<td>● Open course is helpful for fostering</td>
<td></td>
</tr>
<tr>
<td>interest</td>
<td></td>
</tr>
<tr>
<td>● Can find content related to personal</td>
<td></td>
</tr>
<tr>
<td>hobbies, such as: magazine, book, video</td>
<td></td>
</tr>
<tr>
<td>Work:</td>
<td></td>
</tr>
<tr>
<td>● It might useful for future work</td>
<td></td>
</tr>
</tbody>
</table>

Figure 14  Participants response of does the projects are attractive
Table 11  Participants perspectives of the projects in homepage

<table>
<thead>
<tr>
<th>Which projects is attractive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Open course: history, traditional opera, classical culture.</td>
<td>• Open course: The topics of open course are boring, such as the note of war. Lacking interesting and attractive point, the quality is not high and do not have enough time to watch videos.</td>
</tr>
<tr>
<td>• National museum of classic books.</td>
<td>• Do not interested in history, want to see project of medical science and technology.</td>
</tr>
<tr>
<td>• The Preservation project of Chinese ancient books.</td>
<td>• The page of preservation Project of Chinese ancient books looks like an official news publication system, not friendly.</td>
</tr>
<tr>
<td>• Online lecture.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 15  Participants response of use frequency in the future

I will use this website frequently

- strongly: 8%
- Strongly disagree: 8%
- disagree: 15%
- agree: 23%
- normal: 46%
Table 12. Participants’ perspectives of use frequency in the future

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
</table>
| ● Will add it to the “favourite”.  
● Will use it to look for Chinese literature.  
● Will watch open course. | ● Search academic information is not convenient; other websites already can fulfil requirements.  
● The advertisement is not enough, never heard this website before.  
● It cannot provide too much useful information. |
Figure 16. The result page of WenJin search
Figure 17. The homepage of the NLC website
Figure 18. The page of “Open course”
5. Discussion

5.1 The analysis of participant demographics

The participants were chosen randomly from people whose mother tongue is Chinese, and know basic computer operation. Initially, table 1 shows the gender ratio, two-thirds of interviewees are female; the number of females is over three times as the number of male. The main difference of female and male participants is the duration of interview, as figure 1 presents, the female average time of interview are 10 minutes longer than the male, it might indicate female talked more in the interview, or they would like to provided more detailed and deep information. Secondly, most interviewees are postgraduate students, the rest participants have bachelor degree; except 3 participants are working, the other respondents are still studying at university; their age ranges from 21 to 29, three-quarters are under 25. These features show the interviewees sample consists of young people who have received higher education.

Besides, according to these participants visiting history of the website of the NLC, they can be divided into novice and user two groups (Table 1). 8 people said they never used or heard of this website before, so they participated in the research as novice participants. 5 people have used this website before so they are treated as user-participants, but only 1 person was a regular user, and the others just visited 1~3 times before.

5.2 Learnability

A lot of usability studies identified learnability includes ease of learning, ease of use, intuitive operations, intelligibility and other factors (Lee & Kozar, 2012). Table 1 and table2 indicate only one participant is regular user, other participants are novices or just used once in long time ago, so the task 1 was offered no limited time for them to learn and familiarise the main functionality and operation of the NLC website. In the group of novice, no.13 participant just spent the shortest time 25s to quickly skim the homepage and clicked the main navigation menu, then finished the task. In the contrary, no.6 participant spent the longest time 300s on task 1 (Figure
she firstly browsed every section of the homepage, and then turned to the “open course” page read the introduction of classes, she clicked the “user registration” wanted to know how to register the website, at last she found a law database named “Hein online” and read it carefully. Although there are wide variations of familiarizing time among novices, but that not make serious influence, because they all completed the following tasks and questions. In the user-participating group, the longest time to finish task1 is 30s, and the shortest time is 0s (Figure 2), two user-participants think they do not need to familiarize themselves with the website again, so they did not do this task. Table 2 expresses most user-participants do not use the website for a long time, however they also can quickly re-establish proficiency with the NLC website.

The result shows that user-participants averagely spent 16s and novices-participants averagely spent 105s in task1 (Figure 3), actually if do not account the longest time of one participant, the average time of novice should be 73s, this is not a very long period. And participants all successfully complete the interview, it approved user-participants and novices-participants just need less time to accustom the website.

The high learnability can help user to easily complete aims, the main purpose of the user to visit the NLC website is to obtain a variety of resources and information (Song, Zhang, Li, 2011), The NLC website provides a lot of retrieval functions for people to acquire more accurate result, which includes search filters, advanced search, sorting, refine specified resource types, search word recommendations, database source, narrow the scope of search. But participants just used less tools. In the process of result retrieval, the first choice of 76% participants is changing or adding search words to find correct results (Figure 5), it might be useful for people who have clearly target and know specific keywords, but some participants only have an ambiguous conception or lacking searching skill, they do not know how to choose suitable keywords. “Search word suggestion” might be useful for them, but it nearly not automatic appeared when participant typing words. And almost no one noticed the related search words which show in the bottom section of the result page. Except changing search words, participants also have tried other search methods, 2 participants believed changing keywords is the only useful method, and other people consider other retrieval tools are very useful. Figure 6 represents 64% participant thought the most useful search tool is “Refine the specific resource type”, it is quite
helpful to quickly filter irrelevant results, because decide wanted resource types is quite easy, however narrowing the scope of research need specific information, such as author and date. Besides, the most useful search option in the top position of left side, it is a very obvious section.

Many participants want to look for the resources can directly read online, they need to click each result and links to new pages to check does it provide digital resource, actually select the option of “Full text available” in the area of “Narrow the scope of search” is the fast method (Figure 16), but only 2 person found this option and correctly understand its function, other interviewees are either never noticed it or have misunderstanding with its meaning. After I reminded them this option, some participants selected it as most important search option.

Compare with the scores of various standards, intelligibility, easy to operate and navigation all have nice performance (Figure 11). Actually in the process of interview, half participants made mistake to comeback homepage, because the text “back to homepage” is too small to notice (Figure 17). However, the majority interviewees approve the operation is not difficult at all; the language is very easy to understand; the navigation and layout are clear and accurate (Table 5, Table 6, Table 7). The positive opinions of these three aspects support the simplicity principle in the previous research by Willis (2016), keeping things simple which is important to learnability.

The learnability of the NLC website is nice, whatever novice or user both can easily to learn and use the basic operations, though some useful and important things are not visible and obvious, but it not generate serious influence to participant perspectives.

5.3 Efficiency and usefulness

Efficiency analysis based on the performance of task 2 and task 3, the task 2 is information and resource retrieval, a great number of results are represented in 5-10 seconds after participants clicked the search button, but efficiency cannot just judge by the amount of results, a complete searching process should end with accessing the correct results. After checking results relevance by scanning the first 3 pages of
results and clicking the top ranking links, two thirds participants felt satisfied with the first searching results (Figure 4), such as participant 12 only got 48 results, however she found the book she wanted, and the top 5 results in the first page of results all fulfil her requirements (Table 3). If people just want to get catalogue information, the searching has finished, and the searching time not over 1 minute.

While some participants admit except catalogue information, they also wants to obtain the digital resource, “Full text available” is very efficient option, but only two participants found it, other people had to open each links to check it available or not, that is really waste time. Besides, users need to register and log in to get the permission of online reading; after glancing over the registration steps, 70% participant consider the steps is simple and enable completed in 1-2 minutes (Figure 7). In the process of accessing to online resources, 40% participant met different problems such as no response and the error of “404”, other participants have successful accessed the resource but the loading time is more than 48s, which is a quite long time (Table 4).

It looks like some participants went through a series of steps still could not obtain online resource, but 10 participants agreed they can quickly find the required information on this website (Figure 12), and many participant said their primary goal is obtain valuable catalogue information rather than online resource, because they can got resources from other place; and a part of participant have find shortcut for the target in the homepage and do not need search. Additional, every participant immediate find 1-2 methods to contact staff in the task 3, which is high efficiency for people who come to the website for looking for consulting and customer services.

The score of usefulness is 50, it is a nice score in the comparison (Figure 11). 72% interviewees agree the NLC website is helpful for them; which can provides useful information and resource (Figure 13). The effectiveness determined by the property of NLC, as a national library, it not only has over 35 million collections, but also is the biggest digital document resource and service base in China. Users can free access to 114 databases and a great deal of reliable catalogue information, and a part of specific literature only preserved in the NLC. Digital resource only available to registered user, when participants clicked “online reading”, the website would link to page of “user login or register”. After skimming the pages of registration, one third
participants thought registration steps is too much, or care about real name authentication might cause personal information leakage problems (Figure 7), but at last only one person said would not register, others all express willing to register. Usefulness is an important reason why most participants willing spent more time or efforts to register.

In the end of interview, except 2 participants definitely express will not use this website because it cannot fulfil their information requirement; 6 participants said intend to visit again and 5 people clearly indicated will become regular user (Figure 15,Table 12), their motivation all based on the usefulness. As long as participants have checked the usefulness of website and cannot find other better alternative choice, participant will keep using it and do not so concerned negative factors. The finding is little different with the view of preview study (McKinney and Zahedi, 2003; Nielsen, 2003), they thought if users need to consume many cognitive effort for realised task, user will leave and do not use the website again, even if the website can provides users required information. Actually, the reason which results in difference is the uniqueness of NLC, it lacking same type competitors, other websites cannot free provide such enormous numbers of comprehensive collections and resources, and a part of featured resources resource only stored in the NLC.

To sum up, the high efficiency are mainly presented on looking for catalogue and consulting information, however the efficiency of accessing digital resource is quite low. Besides, usefulness had a good evaluation from participants, and become the most important factor of visiting again.

5.4 Satisfaction

According to the definition of satisfaction, which is the degree of pleasant and comfortable when people use the website (Nielsen, 2012); visual design and speed were selected as main investigation factors in the research. Visual design got the lowest score 37 in the interview (Figure 11), the majority of interviewees consider the colour matching is not coordinated; image and icon designing also lack aesthetic; font and size are not suitable; besides, they hates the strange and terrible banners (Table 8). Actually some subpages looks very beautiful and fashion, which are
different from the character of demoded, such as “Wenjin search” page and open course page have combined with modern and classicism in the visual design (Figure 16, figure 18). These subpages were designed and used in recent years, but the currently website version was used from 2008 (Song, Zhang, Li, 2011), so the homepage and other pages which have existed long time, are look like very out of date. The biggest problem of visual design is do not keep a consistent style, especially the homepage used more than 5 kinds colours and font in the one area, which presented a disorderly impression.

The score of site speed is 38 just more 1 point than visual design (Figure 11), in order to decrease the influence of network speed, the face-to-face interviews all used the same unlimited, high-speed wireless network. Although the display speed of most pages is normal, but some pages loading are very slow which leave very bad impression to interviewees, such as the shortest loading time of “online reading” is more than 48s (Table 9). Many participants thought it might due to the location reason, however whatever interviewees use it in UK or in China, and they all have the similar views of speed. Even one participant in China waited 8 minutes for opening the website, but that is very extremely situation might result from the participant own network status.

Visual design and speed both got low score in the participant evaluation, but website speed more directly affects their using experience and behaviours. As Everts (2013) found 2-second delay in load time will lead to substantial rise of abandonment rates in one case study, many participants also said if not in the interview, they would not wait so long for online reading.

### 5.5 Content

The information content on the site is treated as an important standard to evaluate website quality (Venkatesh & Agarwal, 2006). The website content mainly divides into resources, projects and news. All participant selected different topics to search, no repeat keywords were used, table 3 shows 46% search result amount is between 1000 and 10,000; 23% search result amount is less than 900, and 30% search result amount are more than 20,000. It indicated the NLC has advantages in the richness
and credibility of resource. However, due to the copyright restrictions and other factors, some resources have not fully open for users, such as book and PHD dissertations in the self-built special resource database only allowed to read the first 24 pages of the text (NLC, 2015). Participants indicate the NLC website is primarily to fulfil the academic requirements (Table 10), and it has not too much relation with their life and work. Participants will use it again for specific tasks, such as online consulting and literature retrieval, but only fewer participants will become regular users (Figure 15), the showing contents are hard to attract most interviewees to frequently visit the website.

Social education is one of important services of the NLC website, the NLC organized “World Reading Day”, “Wenjin Book Award”, lecture, seminar and other cultural activities to provide various social education services, these activities also presented in the website. Open course are consist of various themes videos, it as an important project was put in the most conspicuous area in the homepage. The topics of open course are prefer to social sciences, especially history and culture, but not everyone are interested in these disciplines (Table 11). Moreover, these course title and introduction used formal and academic language, when participants read these texts they might consider the video is very boring. As one participant said: “these courses look like just recording lecturer’s talking, I cannot sure they are informative and entertaining; and watching video takes long time, my workload is relatively large, do not have enough leisure time to watch videos, so I would rather to read text”(Appendix 8.6). Thus, less half participants consider these projects are attractive (Figure 14).

5.6 Error

The common errors main presented in the process of accessing to online resource, except 4 participants have not found satisfied online resource in the result, other 9 participants all login with a prepared registered account to experience “online reading”, some participants met two problems, the first one is showing user do not have permission, then the helping page display “404 not found”; the another one is no response for click “online reading”(Table 4). These problems were hard to find solutions in short time, so they could not obtain the content of resource. The
occurrence number is not low; more than half participants met these two problems in the process of online reading. It is hard to confirm online reading errors are random or changeless, and precise reasons are not clear, because participants choose different online resource and interviews were not at certain times.

Some participants opened the category of periodical, then found one oversea database is not available, which just write “cable is developing”. After checking every periodical database by the researcher, except this database is not available, other databases all can work normally. It is not very serious problem, user can find replaceable journal from other databases.

There are some special errors in the interviews, one participant could not open the website, and she waited 8 minutes for the page successful loading; the regular user participant clicked register or login would display “internal server error” and the participant has tried many times before but always failure. These errors both appeared for single participant, other participants not met same problems, that might result from the network surrounding or computer configuration, because these two participants all adopt online interview, they used personal computer and network.

5.7 Consumer service

Supportability generally includes user guidance and consumer service (Lee & Kozar, 2012), because the user guidance is hard to find in the homepage of the NLC, so the task-3 only investigated consumer service. The NLC provides different types of contact methods which divide into “contact us”, “Online consultation desk” and “Social media” these 3 categories. “Contact us” in the bottom of homepage, it provide email, telephone, address and postcode information; “Online consultation desk” in the right of the search box, it includes form consulting and online instant messaging; “Social media” in the top right corner which links to official social media account of “Weibo” “WeChat”(Figure 17). These various methods show the NLC pay attention to the customer interaction and services.

At the beginning of task-3 only 2 user-participants known all contact approaches, other participants just found 1-2 categories, and 61% participants did not notice online consultation desk (Figure 8). In this situation, half participants preferred to
make phone call or write email and 38% participant first choice is online instant messaging, and more than one third interviewees said would not make alternative choice (figure 8). After participants had been told all 3 contact categories, their attitudes have changed. According to figure 9, the number of participant whose first choice is “Online consultation desk” increased to 10, these participants think online instant messaging is a fast and convenient method to get reply from staff. Although making phone call also is an instant communication, but it looks like too formal, people might make phone when they have very serious issues and really need to contact staff as soon as possible. Besides, 76% participant are living in Sheffield, the cost of oversea call is too high. Online instant messaging has time limitation, it only open in specific working time, when it is unavailable, half participants would selected send email or make phone call. 7 interviewees mentioned they would not or avoid using the contact method of social media, some of them do not want to expose their personal social information, others consider the official social media account need to deal with a large number of messages, the possibility of reply is too low.
6 Conclusions

6.1 Goal fulfilment

In this study, the primary aim is to make a critical usability evaluation of the website of the NLC. In order to accomplish the goal, I tried to observe and record users’ searching and browsing behaviours for analysing their performance; investigate their feeling and attitude to the NLC website; find existent errors of the website in the using process; sum up the advantages and disadvantages of the NLC in the usability aspect; understand the users’ expectations to the NLC website.

To carry out these objectives, the structured interview was designed for collecting data from 13 participants; the interview was consist of two parts——implement tasks and answer questions. After data collecting and data analysis, all objectives are achieved. Firstly, whatever novice or user visited before, 90% participants need short time to accustom the website, and they all finished 3 tasks without asking help.

Secondly, most participants consider the NLC website is a helpful and useful website to provide academic information and resource; they would like to become users. Thirdly, “online reading” is unavailable for more than half participants; one overseas database has not finished its cable construction; special errors appeared during the process of two participants’ meeting which are registration failure and homepage opening slow problem. Fourthly, the advantages include easy to use; plain language; simple layout; fast to retrieval title catalogue; abundant and various resource; different kinds of customer services. The disadvantages include not beautiful visual design; low efficiency to access online resource; slowly website speed; lacking attractive and interesting contents; some errors has affected normal function. Fifthly, more professional and high-performance information retrieval, modern and aesthetic visual style and adding more disciplines content are the common expectation to the NLC website.

Combined screen recordings and interview transcripts to analyse their behaviours and perspectives, and discuss the website performance based on some important
evaluation criteria of usability, which are learnability, efficiency and usefulness, satisfaction, content, error and customer service.

- The learnability is high, the website is easy to use and learn to use, due to the plain language and simple layout, people only need a short time to skim the content and structure, and then they can completed basic operations.
- High efficiency of retrieval catalogue information and low efficiency of accessing digital resource, according to the nice usefulness, most participants expressed will use it again.
- Bad visual design and low speed result in the low satisfaction, especially the low speed directly make negative influence to normal using.
- The website provide richness and credibility of academic resources, people might will use the website to fulfil the academic requirements, but most projects of social education lack of interesting and diversity, it hard to attract people to become regular user.
- Open homepage is extremely slow and registration failure are serious problems, but these are small probability events and might result from user own network surrounding or computer configuration; and one unavailable database is a little problem and it shows the reason of error so that it will be resolved. The “online reading” errors are really serious and common, these errors lead to the result that users cannot access digital resources and the confusion of errors’ reasons.
- The website provides customer services to enhance the use experience, which are email and telephone, social media, online consultation desk. The diversity of customer services can satisfy requirement of user in different location and time. Most participant prefer to instant messaging, online consultation desk contain instant messaging. However it is put in an inconspicuous position of the homepage so that only fewer participants find it.

According to the discussion of these criteria of usability, the usability of NLC website is normal degree, the learnability, usefulness, content richness and consumer service have a nice evaluation, but content subject, visual design and website speed these aspect also have some disadvantages.
6.2 Recommendations to the NLC website

Based on the result and discussion, the research explored some suggestions to improve the website usability.

- In the page layout aspect, adding “Homepage” into the main navigation bar, when users in other page they can quickly come back to homepage; designing a nice visual style, which include harmonious colour matching, aesthetic fonts and suitable text size; remove the windows in the lower right corner and two banners in the left and right sides, to make the website composition keep the rule of thirds.

- Set email and telephone information, social media links, “online consultation desk” all in the one category, and put this category in the conspicuous position, people can easily find all types of customer services.

- The search results should show full text available or not, just like type, publication, source as default Meta data of each result. So that people do not need waste time to look for online resource.

- Combine hot spot or the topics have strongly connection with people life to design social education projects, and adopting various forms, such as game, competition and cartoon.

- Carefully check the “online reading” functions, find the reasons result in common errors and fix these problems as soon as possible.

- Apply propaganda to increase popularity; many participants do not know what is the NLC, even never heard it before.

6.3 Limitations of the Research

Due to the limited research time and the deficiency of knowledge and experience, there are several limitations in this study. Firstly, participants all are similar education background young people, which between 21 and 29 years old; it is hard to realise sample diversity. Besides, the not too many amounts of sample might make influence to the persuasiveness of research result. Secondly, the task 2 designed as
participants have freedom to search anything they were interested in, the data could not comparing and analysing is complicated; and “online reading” are not set as task or question ,so lead to not everyone experience this function, it also increase the difficult of data analysing.

6.4 Suggestion for future research

The further research might need to recruit more scientifically sampling, that not only increase the sample number, but also focusing on the diversity of sample. Age, occupation, education background should covering different groups as much as possible. Moreover, the tasks and questions can be designed more reasonable and detailed, such as utilize software which can collect and analyse the mouse clicking; deeply investigate how to attract potential users to become regular users.
Bibliography


Dickstein, R., & Mills, V. (2000). Usability testing at the University of Arizona Library: how to let the users in on the design. *Information technology and libraries, 19*(3), 144.


Kasim, R., Alexander, K. and Hudson, J. (2010). Ethical aspects Research Institute for the Built and Human Environment, University of Salford, UK.


8 Appendix

8.1 Demographics information sheet

Your age:

Your gender:

Male          Female

What is your educational background?

What is your occupation?

What is your course/job?

Where are you living now?
8.2 Questionnaire

1. Do you used/visited this website before?

If participant said yes:

2. How often do you visit the website?
   Monthly       Weekly       Daily       Other: 3 month, 6 month, irregularly

3. Please tell me the last time when you visit the website

Task 1. Please browsing and familiar the website

Task 2. Please search any content/information you interested in the website

4. How many results you get?

5. Can you find the relevant/ satisfy information from the result?

6. Would you like to register a account?

7. What would you do to find more accurate information?

8. Do the search filter, advanced search, ranking and other tools are helpful for you? Which one is most useful to you?
Task 3. If you have questions want to ask staff, please show me what would you do?

9. Which kind of customer services would you prefer to choose, why?

10. Do you think the site is readily intelligible?
   Strongly disagree 1 2 3 4 5 Strongly agree

11. Which title/text/sentence makes you feel confused?

12. Do you think the website is hard to use? Why?
   Strongly disagree 1 2 3 4 5 Strongly agree

13. Does the navigation is clear?
   Strongly disagree 1 2 3 4 5 Strongly agree

14. Can you quickly find the required information on this web site?

15. Do you think the visual style/design (colour, background, image) is beautiful?
   Strongly disagree 1 2 3 4 5 Strongly agree

16. Do you think the website speed is slow?
   Strongly disagree 1 2 3 4 5 Strongly agree
17. Is the website useful to provide the information/help to you?

Strongly disagree 1 2 3 4 5 Strongly agree

18 Which aspects of information or help? (i.e., life, study, works?)

19. The website shows a lot of projects/resource, do you think these projects are interesting or attractive?

Strongly disagree 1 2 3 4 5 Strongly agree

20. Which content is most attractive for you?

21. Would you like to use this website frequently? So this question is focus on the people never used before

Strongly disagree 1 2 3 4 5 Strongly agree

22. Do you have any suggestions for this website?
8.3. Research Ethics form

| The University of Sheffield. Information School | The Usability Evaluation of the Website of the National Library of China. |

Researchers

Ruiqi Tan rtan5@sheffield.ac.uk

Purpose of the research

The research aims to establish an objective evaluation of the website of the National Library of China (NLC) and providing recommendations to improve the website.

Who will be participating?

I will invite postgraduate taught students at The University of Sheffield and professions are work in different industry at China. There will be a minimum of 10 volunteers. Each interview will be approximately 30 minutes long.

What will you be asked to do?

There are two types of interview

1. Face-to-face interview
   When you arrive in the place, you would have time to read consent form and ask any questions. After you has signed name, you will asked to finish a brief demographics questionnaire. You have 4 minutes to skim the website, then, you need to do some tasks and answer questions. I will use paper and audio equipment to record interview process; and screen video software to record your computer operations.

2. online interview
   Before the interview start, I will send consent form and a brief demographics questionnaire to you by email, you would have time to read consent form and ask any questions. After you have signed name and finish the questionnaire, please open
the screen recording software to record your computer operations, and I will using paper and audio equipment to record interview process. We will communicate by skype, facetime, chat room or other applications to complete online interview. You have 4 minutes to skim the website, then, you will be asked to do some tasks and answer questions. When the interview finish, you should send the scan copy/photograph of signed content form and questionnaire to me.

**What are the potential risks of participating?**

The risks of participating are the same as those experienced in everyday life. I only want to communicate with participants to get related answers and opinions, in additional, observing their behavior of visiting the website.

**What data will we collect?**

The process of interview would be recorded by audio recording equipment, and recording all of your operations when you visit the websites. Besides, I will use paper and pen to take notes.

**What will we do with the data?**

All the paper documents would be digested as digital forms, these paper copies will be destroyed after data analysis. Video and audio records and digital documents would be kept for data analyzing. All the data will be kept in the file-store system, and store one password protected backup copy in google drive until the dissertation has finished. The analyses result of the data will be write in the dissertation to show what I have found.

**Will my participation be confidential?**

I will anonymize the personal information of each participant; no identifying information will be retained. The data and files will be assigned with an arbitrary reference. You can withdraw from the survey and your data will be destroyed, up to the submission of the final dissertation.
What will happen to the results of the research project?

The results of this study will be included in my master’s dissertation which will be publicly available. If you want to get the result, please contact the School in six months.

I confirm that I have read and understand the description of the research project, and that I have had an opportunity to ask questions about the project.

I understand that my participation is voluntary and that I am free to withdraw at any time without any negative consequences.

I understand that I may decline to answer any particular question or questions, or to do any of the activities. If I stop participating at all time, all of my data will be purged.

I understand that my responses will be kept strictly confidential, that my name or identity will not be linked to any research materials, and that I will not be identified or identifiable in any report or reports that result from the research.

I give permission for the research team members to have access to my anonymised responses.

I give permission for the research team to re-use my data for future research as specified above.

I agree to take part in the research project as described above.

Participant Name (Please print)  Participant Signature
<table>
<thead>
<tr>
<th>Researcher Name (Please print)</th>
<th>Researcher Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>
8.4 Ethics Application Forms

Application 010902

Section A: Applicant details

Created: 
Thu 14 July 2016 at 21:25

First name: 
Puiq

Last name: 
Tan

Email: 
rtan2@sheffield.ac.uk

Programme name: 
Digital library management

Module name: 
INF6000 Dissertation

Last updated: 
19/07/2019

Department: 
Information School

Date application started: 
Thu 14 July 2016 at 21:25

Applying as: 
Undergraduate / Postgraduate taught

Research project title: 
Research on evaluation of the website of the National Library of China

Section B: Basic information

1. Supervisor(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter Willett</td>
<td><a href="mailto:p.willett@sheffield.ac.uk">p.willett@sheffield.ac.uk</a></td>
</tr>
</tbody>
</table>
### 2: Proposed project duration

Proposed start date:  
Thu 14 July 2016

Proposed end date:  
Thu 1 September 2016

### 3: URMS number (where applicable)

URMS number

- not entered -

### 4: Suitability

Takes place outside UK?  
No

Involves NHS?  
No

Healthcare research?  
No

ESRC funded?  
No

Involves adults who lack the capacity to consent?  
No

Led by another UK institution?  
No

Involves human tissue?  
No

Clinical trial?  
No

Social care research?  
No

### 5: Vulnerabilities

Involves potentially vulnerable participants?  
No

Involves potentially highly sensitive topics?  
No

---

**Section C: Summary of research**
1. Aims & Objectives

The research aims to establish an objective evaluation of the website of the National Library of China (NLC) and providing recommendations to improve the website.

2. Methodology

The research will adopt the qualitative approaches, which include interview, observation and literature review.

I will invite postgraduate taught students at The University of Sheffield and professions are work in different industry at China. There will be a minimum of 10 volunteers. Each interview will be approximately 30 minutes long.

3. Personal Safety

Raises personal safety issues? No

Personal safety management
- not entered -

Section D: About the participants

1. Potential Participants

The research purposes determine the target participants should fit these provisions. Firstly, The interviewees should be Chinese citizens, which are the users or potential users of the NLC, even the NLC website provides English version, but the most contents and pages still are wrote by Chinese. Secondly, they need have essential acknowledges and skills to finish basic computer operations, such as searching, visiting website and using email.

2. Recruiting Potential Participants

At first, I will invite the people I knew to participant my survey. Then, I will ask them to introduce their classmates/friends who fit the provisions of participant to me, i will send email/message to invite these people.

2.1 Advertising methods

Will the study be advertised using the volunteer lists for staff or students maintained by CICS? No
- not entered -

3. Consent

Will informed consent be obtained from the participants? (i.e. the proposed process) Yes

There are two types of interview 1, Face-to-face interview When you arrive in the place, you
would have time to read consent form and ask any questions. After you has signed name, you will asked to finish a brief demographics questionnaire. You have 4 minutes to skim the website, then, you need to do some tasks and answer questions. I will use paper and audio equipment to record interview process; and screen video software to record your computer operations. 2. Online interview Before the interview start, you need to download and install an screen recording software from the official website to your computer. And I will send consent form and a brief demographics questionnaire to you by email, you would have time to read consent form and ask any questions. After you have signed name and finish the questionnaire, please open the screen recording software to record your computer operations, and I will using paper and audio equipment to record interview process. We will communicate by skype, facetime, chat room or other applications to complete online interview. You have 4 minutes to skim the website, then, you will be asked to do some tasks and answer questions. When the interview finish, you should send the scan copy/photograph of signed content form, questionnaire and screen recording video to me.

### 4. Payment

Will financial/in kind payments be offered to participants? No

---

### 5. Potential Harm to Participants

What is the potential for physical and/or psychological harm/distress to the participants?

The risks of participating are the same as those experienced in everyday life.

How will this be managed to ensure appropriate protection and well-being of the participants?

The risks of participating are the same as those experienced in everyday life.

---

**Section E: About the data**

**1. Data Confidentiality Measures**

I will anonymize the personal information of each participant, no identifying information will be retained. The data and files will be assigned with an arbitrary reference.

You can withdraw from the survey and your data will be destroyed, up to the submission of the final dissertation.

**2. Data Storage**

All the paper documents would be digested as digital forms, these paper copies will be destroyed after data analysis. Video and audio records and digital documents would be kept for data analyzing.

All the data will be kept in the file-store system, and store one password protected backup copy in google drive until the dissertation has finished.

The analyses result of the data will be write in the dissertation to show what I have found.
## Section F: Supporting documentation

### Information & Consent
Participant information sheets relevant to project?
Yes

**Participant Information Sheets**
- [Ethics_Info_Consent_template3.docx](https://example.com) (Document 028859)

Consent forms relevant to project?
Yes

**Consent Forms**
- [Ethics_Info_Consent_template3.docx](https://example.com) (Document 029860)

### Additional Documentation
None

### External Documentation
- *not entered*

### Official notes
- *not entered*

## Section G: Declaration
Signed by:
RUQI TAN
Date signed:
Fri 15 July 2016 at 12:43
8.5 Ethic Approval letter

Dear Ruiqi,

PROJECT TITLE: Research on evaluation of the website of the National Library of China
APPLICATION: Reference Number 010802

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 19/07/2016 the above-named project was approved on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 010902 (dated 15/07/2016).
- Participant Information sheet 1022084 version 1 (15/07/2016).
- Participant consent form 1022085 version 1 (15/07/2016).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Matt Jones
Ethics Administrator
Information School
8.6 The example of interview transcription

There one transcript in the appendix as an example, others transcripts saved in the research data folder.

Demographics information of Participant 11

Age: 26

Gender: Female

What is your educational background?

Bachelor

What is your occupation?

Branding

What is your course/job?

Marketing manager

Where are you living now?

China
The interview transcription of participant 11, in the following text, “P11” present participant 11 and “R” present researcher.

Interview duration: 48mins and 54s

R: Do you used/visited the website of the national library of the China before?

P11: Yes.

R: How often do you visit the website?

P11: Irregularly.

R: Can you tell me the last time when you visit the website?

P11: Five years ago.

R: I will give you no limitation time; you can review the website firstly.

P11 skimmed the website for 30s.

R: Ok, I have completed the process of reviewing the website.

P11: Please use the “wenjin search” to search any content/information you interested.

P11 chose “Li Shangyin” as search words (Li Shangyin is a Chinese poet)

R: How many results you get?

P11: 5100

R: Can you find the relevant/ satisfy information from the result?

P11: Not bad, I can find relevant resource.

R: Do you have registered an account?

P11: I remember I have registered an account. The registration steps are simple, and the national library website worth to trust so I not mind to provide my real-name information.
R: Let us come back to the page of search results, what would you do to find more accurate information?

P11: I will change keywords to search again.

R: Which search tool is most useful to you?

P11: Change keywords.

R: If you have questions want to ask staff, please show me what would you do?

P11: First choice is “Online consultation desk”, second choice is social media, I feel these official social media account give me reply is fast. When I have formal issue to contact staff, I might make phone call and send email.

R: Do you think the site is readily intelligible? Strongly disagree 1 2 3 4 5 Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 4 agree. Most of language is clear.

R: Which title, text or sentences make you feel confused?

P11: I feel confused about “Microform”, “science and technology novelty search” and “thesis collection and reference”.

R: Do you think the website is hard to use? Strongly disagree 1 2 3 4 5 Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 3 maybe. Some presented information/link in homepage is repeated and redundancy. Besides, she needs to drag down the scroll bar to see the resource navigation.
R: Does the navigation is clear? Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 4 agree. The top navigation bar should not show the date and time.

R: Can you quickly find the required information on this web site?

P11: Yes. But I always search resource in other websites.

R: Do you think the visual style/design is beautiful? Visual design includes color, background or image. Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 2 disagree. It looks like out of date, color matching is terrible, slides and icons are strange. But the style of search page is concise and unaffected.

R: Do you think the website speed is slow? Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 4 agree. Open the NLC website waited very long time, more than 8 minutes.

R: Is the website useful to provide the information or help to you? Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 3 maybe. It can provide me some poet information and title catalogue.

R: Which aspects of information or help? (i.e., life, study, works?)

P11: Study.

R: The website shows a lot of projects/resource, do you think these projects are interesting or attractive? Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 2   disagree. If I know the lecturer , I might want to watch the open course.

R: Would you like to use this website frequently? Strongly disagree 1 2 3 4 5   Strongly agree (You need give a score, strongly disagree is 1, strongly agree is 5)

P11: 2 disagree.
R: Do you have any suggestions for this website?

P11: Improve the appearance of literature retrieval.
8.7 Access to Dissertation

Access to Dissertation

A Dissertation submitted to the University may be held by the Department (or School) within which the Dissertation was undertaken and made available for borrowing or consultation in accordance with University Regulations.

Requests for the loan of dissertations may be received from libraries in the UK and overseas. The Department may also receive requests from other organisations, as well as individuals. The conservation of the original dissertation is better assured if the Department and/or Library can fulfill such requests by sending a copy. The Department may also make your dissertation available via its web pages.

In certain cases where confidentiality of information is concerned, if either the author or the supervisor so requests, the Department will withhold the dissertation from loan or consultation for the period specified below. Where no such restriction is in force, the Department may also deposit the Dissertation in the University of Sheffield Library.

To be completed by the Author – Select (a) or (b) by placing a tick in the appropriate box

If you are willing to give permission for the Information School to make your dissertation available in these ways, please complete the following:

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(b) Subject to the General Regulation on Intellectual Property, I, the author, request that this dissertation be withheld from loan, consultation or reproduction for a period of [ ] years from the date of its submission. Subsequent to this period, I agree to this dissertation being made available through the Department and/or University Library for consultation, and for the Department and/or Library to reproduce this dissertation in whole or part in order to supply single copies for the purpose of research or private study

Name Ruiqi Tan
Department Information school
Signed Ruiqi Tan Date 01/09/2016
To be completed by the Supervisor – Select (a) or (b) by placing a tick in the appropriate box

(a) I, the supervisor, agree to this dissertation being made immediately available through the Department and/or University Library for loan or consultation, subject to any special restrictions (*) agreed with external organisations as part of a collaborative project.

*Special restrictions

(b) I, the supervisor, request that this dissertation be withheld from loan, consultation or reproduction for a period of [   ] years from the date of its submission. Subsequent to this period, I, agree to this dissertation being made available through the Department and/or University Library for loan or consultation, subject to any special restrictions (*) agreed with external organisations as part of a collaborative project

Name

Department

Signed Date

THIS SHEET MUST BE SUBMITTED WITH DISSERTATIONS BY DEPARTMENTAL REQUIREMENTS.