

User-centered information architecture of University Library Website

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Abstract—To improve website usability, the information architecture of library website must be designed to meet the real needs from users. Based on user-centered design method, analyze and research users to get the user's real needs. Create personas and do qualitative analysis to determine the features and functions of library website. Classify the information architecture of library website by card sorting. Design information architecture by clustering analysis, and revise the width and depth of the information architecture. The practice shows that there is clearer hierarchy in the information architecture of the library website that is designed based on user-centered method, and it is easier for users to understand and acquire information and services provided by the library. In other words, the information architecture designed by user-centered method is with more reasonable information classification, more clear information structure and much higher usability.

Keywords- *User-centered; Information Architecture; User's Objective; Card Sorting; Clustering Analysis*

I. INTRODUCTION

In order to meet the needs of the digital library, library websites are the communication interfaces between libraries and their users. Libraries would meet all levels of users' needs via the web site, and guide users to explore wealth online resources, and further improve service quality, expand the depth and breadth of services [1]. There are many problems in the construction of university library website, such as monotonous content, uncreative style, unreasonable information architecture, etc, in which, the unreasonable information architecture design of web site has an significant impact on users' accessing information and services from library [2]. Information architecture determines how to organize the site's content, how to design structure so that users can quickly find the required information. Therefore, the construction of library website should focuses on the design of information architecture. The design of information architecture must follow the principles that meet the user needs, not only to consider the relevance of the content, but also to pay close attention to users' convenience.

User-centered design methods can effectively design the information architecture with high usability. Users will always be placed first in all the process, user research and understanding as the basis for various decision-making. As the same time, products evaluations in various stages also

come from user feedback. Users are the core of the whole process [3]. In this paper, the reasonable information architecture of university library website will be constructed by user-centered design method.

II. THE CONCEPT OF INFORMATION ARCHITECTURE

Information architecture is the term used to describe the structure of a system, i.e. the way information is grouped, the navigation methods and terminology used within the system. Information architecture is a consolidation of information, information systems and user needs mediation process. The information architects focus on the design of organization, indexing, labeling, and navigation systems to support browsing and searching throughout the website [4]. This structural design will allow users to access information more direct and to complete the task more easily.

In website design, information architecture design is especially important. Website information architecture is to classify the content of a website, and create interactive navigation for the content. The amount of information is unlimited, and the users' backgrounds are also various, only the information architecture of the website is in accordance with the using habits and expectations from users, then the website can facilitate users, and attract users.

In information architecture design, the qualitative studies for website users can acquire the information architecture needs for a large number of users. On this basis, the quantitatively processing and analysis for user needs is done. Finally, the information structure is designed based on the above results.

III. THE USER ANALYSIS

The user-centered design asks designers to consider user' needs from users' point of view. These items that reflect unique resources of website and have been explored frequently by users should be placed on a higher level position, so that the users need only a few clicks, to access library resources and services. To determine the users' access needs, it is necessary to adopt scientific methods to analyze users, research users, to get the users' real needs, which are the basic data for the library website information architecture design.

As library users are relatively stable, it is practicable to build personas via qualitative personas approach. Firstly, qualitative research is done via user interviews, and then these user groups are subdivided based on qualitative

research, finally, the persona is created for each sub-users group to fully discuss their personal goals.

A. *Qualitative research based on user interviews*

Recruiting interviewees on campus, the interviewees include students, teachers, staff, visiting scholars. In the interview, the following main theme of interviews will be identified with the understanding of school library, the objectives and behavior of interviewers and the opinions and motives of those.

B. *create sub-users group of library website*

Through the above qualitative interview study, it's based on "users' goal" to create sub-users. Via analysis, the following main objectives to visit the library website are as following: to understand the library, access to electronic resources, query (inventory, loan, etc.), online renewals, and reservations. Creating one target user group based on one goal, so these goals are basically covered all users of the library website.

C. *create specific personas for library website*

Subdivision on the users of library website to create authentic characters of library website, three personal objects were created: freshman, junior students and teachers, as representatives of different user groups.

D. *determine the library features and functions based on personas by qualitative analysis*

After determining the personas of the library website, using brainstorming to determine the library features and functions based on personas by qualitative analysis. In brainstorming, for these three personas, fully discuss their personal goals, and then analyze the required functions that meet the users' goals.

1) For the class of freshman, the fast channels are provided to introduce library, including basic rules and regulations, floor distribution, institutional settings, and so on. 2) For the class of junior students, convenient inquiry service, online renewal, book, and other self-service capabilities are provided; furthermore the query process is simplified. 3) For the class of teachers, more information retrieve services, more resources database are provided to carry out scientific research.

The personal goals of personas are combined with responsibilities of school library service, and then to get the function list corresponding to the real need of the library website (In the case of Chongqing Three Gorges College Library Website).

User's guide, online book selection, English databases, opening hours, news, trial databases, the Three Gorges literature, museum presentations, collection query, bulletin, book recommendations, Chinese databases, Chinese library classification, library introduction, the reader's message, compensation regulations, collection distribution, institutional settings, CD with the book, premises style, admission notes, the core list, ancient collection, borrowing rules, the reader query, floor distribution, illegal newspapers

and periodicals, registration of lack books, papers uploading, audio visual online.

IV. DESIGN THE INFORMATION ARCHITECTURE OF LIBRARY WEBSITE

By qualitative analysis on the users, a overall list about information functions of library website is obtained, so it should be classified and organized scientifically, in order to access information more directly and complete their tasks more easily for users. Card sorting combined with cluster analysis is often used as a method of analysis of quantitative information [5].

A. *by card sorting method classify information architecture of library website*

Card sorting is a technique to understand how user group information within a particular domain by having users organizes cards representing specific types of information from their perspective [5]. With card sorting, designers can understand the users' ideas and furthermore better complete the information architecture design.

On the basis of the function list of library website, cards are created with each set of 31 cards. Four people are recruited on campus to participate in the card classification.

Firstly, the cards are divided into groups in accordance with the logic relation. The 31 cards are divided into 11 groups marked with a thin oval. In the classification process, the number of groups and the number of cards in each group are freely selected by participants based on understanding the card content. For example: "English database" is combined with "Chinese database" and "trial database" into a group named "resource database ". Secondly, the new card groups will be further merged into a higher level group according to the logical relationship between each group. Thirdly, each high-level group generated in the second step is named. For example: "resource database" is merged with "user's guide" and "audio visual online" into a large group (also known as high-level group), and named "electronic resources". In this way, the 31 cards are constructed 7 high-level groups marked with thick oval; consequently the information classification results by card sorting are obtained.

B. *By cluster analysis process the card sorting results*

After the card sorting test, the results can be analyzed by different methods. Cluster analysis is a quantitative method for the study by group. Using this method, the results of card sorting test can be calculated comprehensively to get distance matrix, and then using different algorithms, the distance matrix is processed and draw the tree diagram easy to analyze and understand [5].

Firstly, a matrix is constructed, whose order is equal to the number of 31 cards. The location of the row and column of each element in matrix labels the relationship between the two cards. In the specific trial, for one participant, if two cards are classified into the same low-level group, the assignment is 3. If a card and another card in the high-level group is a higher-level group, the assignment is 2. If the two cards are neither in the same low level group, nor in the same high-level group, but in a higher level, the assignment is 1,

other values are 0. These values constitute a "raw score matrix for one participant".

Secondly, the values of corresponding elements of single original matrix from four 4 trials are added together to make "raw score matrix for all participant".

Thirdly, each value of entire original value of the matrix is divided by the maximum possible value: $3 \times n$ (n=the number of entire trials), to make the similarity matrix.

Fourthly, similarity matrix is translated into distance matrix using the formula 1.

$$D(i, j) = 1 - S(i, j) \quad (\text{formula 1})$$

In which, $D(i, j)$ represents an arbitrary random element in distance matrix, $S(i, j)$ represents an arbitrary random element in similarity matrix.

Each element of distance matrix is also known as distance score. These distance scores are between 0 and 1. The more closely card i and card j are placed together by trial participants, the lower $D(i, j)$ will be. If card i and card j are placed in the same low-level group, then $D(i, j)$ will be 0. If card i and card j are placed neither in any low-level group nor high-level group, then $D(i, j)$ will be 1.

By observing and comparing the elements of distance matrix, the concept about project classification can be obtained. But when the number of cards and the distance matrix elements increased sharply, it becomes very difficult to analyze data by observing matrix elements. In this case, cluster analysis is used to translate the above distance matrix to tree diagram, in order that the test results can be observed and analyzed. Cluster analysis is divided into several algorithms according to the rules for measuring the distance among the groups. In such cases, single algorithm is used for processing data. Based on the distance matrix, the cluster analysis tree diagram of the library website is obtained (figure 1), finally, based on the tree diagram, the information architecture of library website can be obtained.

C. the width and depth of information architecture

The results of qualitative analysis and quantitative process of user needs provide a very effective guidance in the design of website information architecture, the "width" and "depth" problems needed to be considered too.

The width is the number of layers of categories and subcategories. The depth is the number of layers of categories and subcategories [6]. For the same number of information nodes, increasing the width of a certain level of information structure can reduce its depth. Similarly, adding the depth can reduce its width. The information structure with large width and small depth means that the hyperlinks on each page are more and the site level is less. Such structure provides more information on each page for users, but the number of user clicks to the target page is required

relatively less. In contrast, the information structure with small width and large depth means the hyperlinks on each page are less and the site level is more. Such structure provides less information on each page for users, but the number of user clicks to the target page is required relatively more [7].

According to the above principle, the information architecture design of library website is revised. The information structure of contents is the basis for navigation design, and navigation is a concrete implementation of information architecture, therefore designers design website navigation based on its information architecture, and then complete the overall design of the website to help users efficiently complete the task and achieve their goals.

V. CONCLUSION

Using user testing combined with heuristic evaluation, the library website is evaluated, which is constructed by user-centered design methods [8, 9]. Evaluation results are as follows: firstly, the number of information main categories is reduced, so information hierarchy is much clearer. Secondly, users' efficiency on the website is improved. Thirdly, error rate and help-frequency are reduced. In a word, user satisfaction has been improved significantly. By studying the needs of users, there is clearer information hierarchy in the information architecture of the library website, and it is easier for users to understand and acquire information services provided by the library.

REFERENCES

- [1] Wu Weici. Introduction to Library Science. Beijing : Beijing Library Press, 2002
- [2] Huang Xiuying. The Problems in Construction of Library Site . Journal of Information, 2005, (5): 124 – 135.
- [3] Cooper A. About Face: The Essential of User Interface Design. Foster City, CA: IDG Books Worldwide, 1995
- [4] Peter Morville, Louis Rosenfeld. Information Architecture For The World Wide Web (Third Edition) . O'Reilly Media, November 2006
- [5] Aldenderfer M S, Blashfield R K. Cluster Analysis. Beverly Hills, CA: Sage, 1984
- [6] Nielsen J. Designing Web Usability: The Practice of Simplicity. Indianapolis, In: New Riders Publishing, 2000
- [7] Nielsen J, Tahir M. Homepage Usability: 50 Websites Deconstructed. Indianapolis, In: New Riders Publishing, 20002
- [8] [8] Fu L, Salvendy G, Turley L. Effectiveness of user testing and heuristic evaluation as a function of performance. Behaviour and Information Technology, 2002, 21(2):137-143
- [9] Fu L, Salvendy G. The contribution of apparent and inherent usability to a user's satisfaction in a searching and browsing task on the Web. Ergonomics, 2002, 45(6): 415-424