The Research of Web Usability Design

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***Abstract*—Web is a specific interactive system which is in a wide range of application areas, but there are with different degrees of usability problems. Therefore, it is necessary to provide a design method for Web usability. Based on the theory of user centered design (UCD) and usability engineering principles, Web usability design includes three aspects: user research, Web design, and Web evaluation. User research focuses on target users, and researches user's goal, behavior and views by user modeling based on personas. Web design focuses on information architecture design, readability design, search design and page design to design the self-described Web user interface with high-usability. Web evaluation is a measuring means for iterative process of Web usability design. The method will be a guideline to design and improve Web usability for designers.**

Keywords-usability engineering; Web usability; user research; Web design; Web Evaluation

I. INTRODUCTION

Web is hailed as one of the greatest inventions in the twentieth century, and its rapid development not only provides unprecedented convenience channels for global communications, but also affects all aspects of human life. Most websites are ever growing, evolving collections of information and services[1].These information and services have been a large number of applications in the office, business management, shopping, and entertainment etc. They provide much wider opportunities for businesses and much richer services for users. At the same time, Web is a complex information environment, and a specific human-machine interactive interface[2]. Compared to the traditional software interface, Web interface is back at least 10 years [3]. As using Web, users find it difficult to learn, complex to operate, or not easy to understand. According to Jakob Nielsen's studies, websites are with different degrees of website usability problems generally[4]. If the user isn't satisfied with it at the first visiting, 40% of users will not visit the site again[5]. Thus, the usability problems of websites have broad universality and severity, and will have a negative impact on websites' development. Therefore, in Web time, to achieve the purpose of the site, it should allow users to feel good usability. Web usability has moved from a "nice to have" to a "must have" [6]. We must find ways to reduce usability problems, and design high-usability website. The research is to provide a simple and effective Web design methods and steps to improve Web usability of websites, which are satisfying for users.

II. WEB USABILITY

A. Usability

The only goal of the human-computer interaction (HCI) is to meet user needs and expectations as much as possible, and then to improve the usability of software systems[7; 8]. Usability methods have from the beginning of times, that is to say the early 80's, always included users to varying degrees. The usability is an important indicator of quality of the interactive IT product or system. Nielsen has pointed out that the usability is effective, easy to learn, efficient, easy to remember, the fewer mistakes and satisfaction for product users [9]. The international standard ISO 9241-11 defines usability as follows: effectiveness, efficiency and satisfaction what are qualities of products in a particular environment for a specific user for specific purposes[10]. The concept of usability engineering appeared, as people have an emphasis on the quality of product since the 80s of last century, and then has correspondingly formed a popular area in academia and industry. Usability engineering is an engineering methodology for the IT product and user interface development, throughout the product life cycle stages. Its core is UCD methodology, stressing from the user's point of view to design and development [11].

B. Web Usability Design

In Internet time, Web-based applications are to interact with users through the Web user interface in Internet. Web interface is a specific human-machine interface based on Internet technology, and Web is a special interactive system in the Internet environment. Web usability engineering is that principles and techniques of the usability engineering are applied to Web design, so that Web designers construct user-centric website rather than the technology-centric website, who should focus on its user, rather than the computer's input and output[12]. That is, Web design is changed from technology-driven to user-driven. Web interface design is developed from the graphical user interface (GUI) design about software based on screen, and the design to following the same design fundamentals of other[13]. That is Web design must directly face "users with the specific needs", and must ensure that users are pleasant to successfully complete tasks with Web. Web design usually adapts a design -

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evaluation iterative design process to improve its usability. Web usability design includes the following three main elements: research users, Web design, and usability evaluation.

III. User Research

The UCD approach focuses on systems development being driven by the user's requirements instead of technical requirements. Design should depend on measures of how well the product has been used by highlighting user's interaction and by making use of an iterative prototyping development process[14]. When the methodology is applied to the user as the center of application; the users must be identified and analyzed by the user modeling. A user model has to be an integral part of any interactive system. A user model is different from both the actual knowledge possessed by a user and knowledge employed by system designers [15].

A. User Modeling

There are several modeling techniques: user roles, user segments, extreme characters [16], personas, etc. User roles and user segments are not particularly useful for developing user scenarios and for accommodating different users in a single project. Extreme characters is not a method that makes possible the characterization of real system users. By comparison, personas is a better modeling method based on the identification of characters who typify the system end user.

B. Personas

1) Creating Personas

Personas[3; 17] , introduced by Alan Cooper, are a technique of goal-directed design that is meant to help designers gain clarity and provide focus during the design process. They describe the goals and activities of archetypal users in a 1-2 page description based on a few ethnographic interviews with real users. Quesenberry[18] states that, though the personas are traditionally created based on contact with real users - for instance, by interviews, contextual checking, and other qualitative means - the information that constitute the basis for personas can be collected by a team or a corporation. The personas might be increased with details of true or imaginary stories. Personas are a design tool generally used within interaction design that help to give the interaction design team an idea of what a user may desire from a system [17]. Personas are defined by their needs and goals. These include their personal goals as well as their goals for the system. A goal-directed design project may, and probably will, have multiple personas because different kinds of users with different goals will use the system[19]. The system may not be designed for all personas. However, each system will have at least one primary persona. A primary persona is someone who must be satisfied with the system for it to be considered a success and who cannot be satisfied with an interaction designed for another persona. The user interaction designed for each primary persona should be based on the needs and goals of that persona.

Based on the type and the analysis for user research, there are two main methods to create persona[20]: qualitative persona and quantitative persona. Qualitative research is the method that discovers new things from the small scale sample. The methods of qualitative persona research include: user interview, field investigation and usability testing. Through qualitative research, get the objectives, behavior and views of user. Quantitative research is the method that tests and proves certain things through a large number of samples. The methods of quantitative research include: questionnaire, log file analysis and user relationship management analysis and etc. The new way combined quantitative into qualitative is to create persona, which verifies and improves qualitative persona through quantitative methods. Through the quantitative research, verify the user groups divided by users' quality. Persona is described with the goal, behavior, views, and the demographic characteristics.

2) Using Personas

Persona can clear the process which includes determining the functions and content of software and determining their priority. Persona plays an immeasurable role to make decision in advance. When determining the qualitative features and functionalities, persona can be used in brainstorming, to determine the priorities, to guide site structure, content and design. In brainstorming, discuss all the possible features, functionality and content based on the persona's goals, views and behaviors. Through brainstorming, get a list of user functional requirements. By grading the each potential function with persona, it's very easy to get scientific evaluation results that will be used to sort the all functions by their priority.

IV. Web Design

A Web interface is a complex mix of text, links, graphic elements, formatting, and other aspects that affect the Web's usability. Instead of spending time to explain how to use interface, it is better to take advantage of the self-describing information of interface elements to dominantly display the using process of the software, at the same time, Interface performance and behavior must be consistent with user actions habits and mental models[21]. In Web design, standards-based design has the following advantages: download and read faster, better accessibility, more conducive to search engine rankings, adaptability, easy to develop and maintain it. In a word, standardized Web can enhance the usability and significantly enhance the user experience. Consequently, Web design entails a broad set of activities for addressing these diverse aspects: information architecture design, readability design, search design and page design.

A. Information Architecture Design

In information architecture the focus is on the organization, navigation, labeling, and search systems that offer accessibility to the end user[22]. With information architecture coupled with good user interface design principles, there is hope that the users will be better able to realize what information resides in a large website and then

be able to navigate through it to find what they want. Specially, organization systems are composed of organization schemes and organization structures. Navigation system plays a major role in shaping our experiences on the Web. It provides access to information in a way that enhances understanding, reflects brand, and lends to overall credibility of a site. And ultimately, Web navigation and the ability to find information have a financial impact for stakeholders[23]. A navigational mechanism is a link or group of links that behave in a similar way and have a similar appearance. Links and label names mute are specific; make sure users can easily understand your navigational labels.

B. *Readability Design*

With a few exceptions, people visit the Web for its utility, not its beauty. User chooses clarity over confusion. The Web is a user-directed medium, where people adopt information-seeking strategies to save time. They tend not to seek information in a linear fashion. Instead, they rely on the visual cues that give off the strongest signal that their answer is nearby. People direct their attention to these areas and ignore everything else. So, write for the way people read on the Web. Design Web's content to match human behavior and tailor it for optimum scannability and comprehension. Use simple language, out of respect for users' time and reading skills, keep Web's writing simple and concise. Three guidelines for better Web writing: skip the jargon, avoid acronyms, and bar sarcasm, subtle word play[24].

Artistic elements such as typography and color schemes play an important part in making a good first impression with website[5]. Typography gives people a feeling for your company and conveys information about what they can do on your site. Different fonts can signify whimsy or gravity, and point size and color can emphasize content. Sustaining positive impressions throughout the site means choosing the type and colors that work best on the Web. Four top guidelines for type: use common fonts sized at or above 10 points, avoid busy backgrounds, use black text on white backgrounds, keep moving, all-cap, and graphical text to a minimum. When choosing a font for your website, make sure to opt for those that are available on your users' computers and browsers. Limit the number of font styles on your site and apply them consistently. Along with the right typeface and size, the right color contrast ensures legibility and readability on your site.

C. *Search Design*

Search is such a prominent part of the Web user experience that people have strong expectations for how it should work. Search is one of the most important design elements on a website. User wants the search on websites to work like that of their favorite major search engine. Given how ingrained Search is, avoid invoking a user's mental model of search for other interactions. Users are now forming mental models that they expect to apply across the Web. The No. 1 guideline for search result pages design is to mimic the search result pages on the major Web-wide search engines. Provide a linear list of search results, with the most recommended on the top. Usually the search engine results page should be sorted by relevance, and no other options should be made available, since they will only confuse the user. For some types of sites, however, it makes sense to make other sorting criteria available.

Users almost always turn to search engines with a new problem but almost never read beyond the first page of results, so search engine optimization (SEO) should be one of the most important parts of Internet strategy. There are three major classes of “white hat” SEO techniques [25]: linguistic SEO, architectural SEO, and reputation SEO.

D. *Page Design*

Page design includes two parts, the first is graphic, and the second is HTML coding. Graphic design focuses on visual presentation. Experience design encompasses all two of these categories, as well as properties that affect the overall user experience (download time, ads, popup windows, and so on)[26]. HTML coding is very important in page design. The HTML coding design should support of Web standards and browser compatibility.

Web standards are a number of standards set developed by the W3C and other standardization organizations, in order to create and explain the Web content. Describe the structure of Web pages with the structured standard language (such as: XHTML, or XML); format the page presentation with the standard presentation language; define the behavior of Web pages with the standard behavior-controlling language. Specifically: (1) Separation of structure and presentation. HTML documents save the content and structure, and CSS (Cascading Style Sheet, Cascading Style Sheets) documents control the performance of the documents. (2) Using XHTML. XHTML1.0 Strict and valid document type (doctype) can create a strict website.（3）Using CSS. The structured and semantic XHTML describes the Web document; CSS efficiently controls the layout[27]. In the CSS design process, designers must fully understand CSS syntax and model, instead of relying only on its presentation.

From Web pages towards Web applications, Web browser becomes an application platform [28]. The browsers are in a wide range. According to the statistics data in December 2009 [29] , the current widely used browsers are: IE8(13.5%), IE7(12.8%), IE6(10.9%), Firefox(46.4%), Chrome(9.8%), Safari(3.6%), Opera(2.3%) and etc. Therefore, the browser compatibility problems are considered necessarily in the Web design. Due to differences in understanding and support for Web standards, the same page may be interpreted to different results by different browsers. Without a browser compatible design the website may be serious usability problems through some browsers.

V. EVALUATING AND VALIDATION WEB DESIGN

In Web page design, a design - evaluation of iterative design process is adopted to improve Web usability. The traditional usability engineering emphasizes the precise definition of Usability metrics. Whiteside and etc provides a set of quantitative metrics. According to the principles of usability metrics[30], Melody Y. Ivory provide a tool which called Webtango [31], Webtango explores automated

approaches for helping designers improve their sites. It's goal is to create an interactive tool that helps steer occasional website builders away from bad designs and toward better ones — a "quality checker" tool analogous to a grammar checker in a word processor. This design-checking approach is not intended to replace usability testing, but rather to complement it. With quantitative methods, it analyzes and measures the information, navigation, presentation and etc. Ed It. Chi, Peter Pirolli and James Pitkow present an architecture and system for the quantitative analysis and prediction of user behavior and website usability[2]. Simulation has also been used for Website evaluation. Chi, Pirolli, and Pitkow have developed a simulation approach for generating a site's navigation paths based on content similarity, server log data, and linking structure. Other automated critique tools, such as KRI/AG tool (knowledge-based review of user interface) [36] and IDA (user interface design assistance)[32], perform rule-based interface critiques. HTML code validation can adopt validation service provided by the W3C. W3C provides validation service for HTML and XHTML markup in http://validator.w3.org/, and provides validation service for CSS in http://jigsaw.w3.org/css-validator/. According to the specific error messages through validation, amend Web pages, fully improve the degree of Web page standard, consequently to enhance their usability.

VI. CONCLUSION

The Web interface is a specific HCI interface, and Web application is the special interactive system. The usability is important for successful websites. The Web design should focus on website's users to enhance its usability. Web design must directly face "users with the specific needs", and must ensure that users are pleasant to successfully complete tasks with Web. Web design usually adopts a design - evaluation iterative design process to improve its usability. Web usability design includes the following three main elements: research users, Web design, and usability evaluation. Based on the above research, this paper concludes the specific methods for Web usability design as follows: under the guidance of user-centered design, fully understand the content of Web design, learned to design ideas of other areas; determine the features and functions of websites, through researching the user goals, views and behaviors with persona; construct a reasonable Web information framework; follow the general principles of navigation design, optimize Web interface, write for the way users read on the Web, build reasonable search in internal website, follow the Web standards, in order to construct self-described Web user interface with high-usability; Web evaluation is a measuring means for iterative process of Web usability design.

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