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Study on the Usability of Online Test Websites

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Abstract
Online test websites can provide a more convenient and efficient dynamic learning approach and personalized learning services, which is one of the important approaches to digital learning. However, the usability of online test websites affects users' learning efficacy. This study explored the impact of the usability of online test websites on users, and the results can help website operators seeking to improve the websites' usability. Based on the relevant literature, this study synthesized three major metrics of the usability of online test websites and summarized typical work priorities of such websites to design usability test items. The study considered one online test website: A Remedial Education Institution for Learners to Take Civil Service Examination. The results show that, with respect to usability, the website still has quite a few deficiencies that affect users' effectiveness and efficiency when using the website and cause users to be less satisfied with the website. Based on these results, this study offered four specific recommendations for improving effectiveness, efficiency, and satisfaction in terms of the usability of the online test website: enhancing interaction and instructions, following the inertia of interface use, simplifying information organization, and diversifying information content.

Keywords: Online Test Website, Usability, Digital Learning

1. Introduction

The online learning channel for digital learning styles has become a learning tool frequently used by the public. With the help of network technology, evaluations and tests, which play an important part in learning activities, can also be remotely conducted through computerized tests. Computerized tests have become a trend in modern examinations because they can improve the efficiency of the examination process and save labor costs.

Online tests are also a component of distance education. The online test system can help test takers obtain immediate evaluation and feedback through functions such as the personal file, data statistics, diagnosis, and other recordings and analyses, thereby providing the opportunity to understand their own learning efficacy and engaging them in further thinking about deficiencies in learning (Li, 2001). Many online test websites currently include the functional features of random questions and instant test/evaluation. Users can experience non-linear learning

through the test model of random questions. Meanwhile, instant test/evaluation enables users to review and reflect on their own learning, including blind spots and deficiencies, immediately following the test, thereby achieving better learning efficacy. Online test websites make full use of the great strength of computerized tests combined with the Internet and provides an online platform for instant evaluation on learning. It enables the test takers to think deeply about their deficiencies in learning immediately after the test and achieve learning efficacy, not just test results (Chen, 2007). Therefore, online test websites not only provide test and evaluation results, but are also another type of digital learning style.

Internet resources for diversified learning styles are constantly being searched for and used. However, if the design of an online test website fails to take into account the website's usability, users will be unable to achieve the expected effectiveness even if the website includes a wealth of question bank resources or detailed data analyses. As a result, users cannot achieve learning efficacy due to the complex steps in using the website, the interference of additional business processes and other factors, or too many errors on the website, which result in negative experiences, causing users to reduce their use intention. An indirect result is that the online test website cannot fulfill its role as a learning resource, and the enterprise that set up the website cannot serve its corporate clients. Therefore, the purpose of this study is to identify and discuss the usability problems of a website by assessing the usability of Company A's online test website and, based on the results, provide suggestions to the website designers for improving the website's usability. By improving the website's usability, its utilization rate can increase and its learning resources can be more easily used.

2. Literature Discussion

2.1 Online Test System

Online testing has been widely used. It can be used as a tool to assist traditional teaching, as an evaluation method for distance education, as a tool for classwork exercises or evaluation, and as an aptitude test for career development. Online tests combine the effectiveness of computerized records, statistics, and analyses with the convenience of network information communication, enabling the test taker to get feedback quickly and understand dynamic learning efficacy from the feedback data (Li, 2001). When using an online test system, students can receive scores, notification of incorrectly answered questions, and answers and explanations immediately after completing the test, thereby ensuring the effectiveness of teaching and review (Lee, Li, & Kuo, 2014). Jan, Lu, and Chou (2012) asserted that the learning model provided by the online test could help students improve their learning efficacy. Teaching supplemented by the online test focuses on individualized learning, developing students' abilities to think, observe, understand, analyze, and reflect independently while learning the content.

Online tests incorporate both the effectiveness of computerized tests and the convenience of network communications, but they also must deal with deficiencies inherent in these two characteristics. An online test must rely on (1) the stability of software and hardware of computer equipment and (2) the stability of online network communications. Without stability in these two areas, the effect of the online test will certainly not achieve the expected results. However, these two problems are also common problems in general information and electronic communication products. Online test systems face another common problem: web server effectiveness. If too many users are using the system at the same time, the server's feedback effectiveness may be impaired, which will also cause adverse effects for the online test system (Liao, Pan, & Tsai, 2013). Therefore, great importance must be attached to the effectiveness of usability in the system design.

Online test websites are an application of online test systems. The online test uses a modular independent system, which can provide online users with a website platform for individualized learning at different times and places. Most current online test websites are individualized learning systems that provide test exercises. Their ultimate goal is to provide mock test exercises. Thus, different test methods are presented according to different test types. Therefore, online users have specific and clear learning goals when performing test exercises, conforming to the concept of online learner-centered design. Ma (2016) asserted that online learners are users of information, so their needs are closely related to users' satisfaction with the information. User satisfaction is mostly derived from the

correction of user information satisfaction. According to Ma, the priorities for meeting online learners' learning goals include clear learning goals, reviewable course content, multivariate types of test questions, and an easy-to-operate interface. Therefore, a good online test website must have a simple, clear, and easy-to-operate method and clear test simulation goals. Only in this way can it conform to the individualized and learner-centered learning style.

2.2 Usability

Usability is mainly derived from the concept of user-centered design (UCD). As proposed by Gould and Lewis (1985), in the case of a program or system, usability refers to the extent to which it is easy to learn, the extent to which its design contains the functions necessary to enable the user to perform the task, and the extent to which it is easy and enjoyable to use. Preece (1998) pointed out the concept of usability as helping users perform their tasks on the system quickly, practically, efficiently, and enjoyably. International Standards Organization (ISO) defined *usability* in ISO 9241-11 (1998) as follows: "Helping specified users to achieve operational goals with effectiveness, efficiency and satisfaction in a specified context of use." *Effectiveness* refers to the accuracy and completeness with which users achieve their goals. *Efficiency* refers to the resources expended in relation to the accuracy and completeness with which users achieve goals. *Satisfaction* refers to the extent of subjective satisfaction and acceptance experienced by users during the use of the product.

Usability is a quality attribute that assesses how easy user interfaces are to use. Usability also refers to methods for improving ease-of-use during the design process (Nielsen, 1993). Nielsen (2012) concluded that usability is composed of the following five characteristics:

- Learnability: When users visit the website for the first time, can they quickly get started with the basic functions of the website?
- Efficiency: After users have a better understanding of the design of the website, will they be able to use the functions in the website quickly and smoothly?
- Memorability: When users visit the website for the second time, can they immediately recall how to operate on the website?
- Errors: How many errors do users make? How severe are these errors? Can users resolve these errors?
- Satisfaction: After use, how satisfied are users with the website as a whole?

According to Rubin & Chisnell (2008), under the interface environment of the Internet, a website's usability enables users to make efficient and easy use of the functions provided by the computer system and has the auxiliary design that enables users to read, input, and search information easily as well as achieve the purpose of use quickly.

2.3 Metrics for Usability Evaluation

Scholars do not have a unified standard for the attributes of usability metrics. Different users, task objectives, and website attributes will have different target attributes, which will in turn produce different usability evaluation metrics. In addition, due to their respective characteristics, websites are divided into different types, so the usability metrics used also differ. According to Pant (2015), usability is multifaceted and interpreted from different perspectives depending on the assigned task, user, product, and environment. Nielsen (2000) noted that usability evaluation is a method to observe the actual use of a product or service by individuals to record the user experience and, through surveys, determine whether the use of the system is successful or not. In order to determine the positioning of usability in a system, we must start from the acceptability of the system (Nielsen, 2000).

In this study, the usability metrics of ISO 9241-11 (1998) are combined with the insights of various scholars, three major orientations—effectiveness, efficiency, and satisfaction—are used as the usability evaluation metrics, as discussed next.

2.3.1 Effectiveness

Effectiveness is used to evaluate the main items of usability, the capability of the online test website to function effectively, and the extent to which the digital content resources meet users' information needs. The corresponding sub-metrics include:

- Ease of use
    - Whether the provided website browsing generatrix and functional operations conform to the using habits and cognitive abilities of most users
    - Whether multiple browsing methods are provided to facilitate the user's choice
- Organization of information
    - The extent to which the language of the interface is easy to understand—namely, whether the website interface is friendly to the language that is easy to be understood by the website user group
    - How easy it is for users to obtain website information, which mainly refers to whether the interface design of the website and the screens presented by the web page data are concise and clear, so that users can find information easily
- Visual appearance
    - The appearance of the website interface can focus on the user's vision, and the locations of function buttons or link paths adopt the operating modes familiar and intuitive to the user, reducing the load of short-term memory
- Error correction
    - Whether clear and easy-to-understand instructions are provided
    - Whether the guidance for error correction is provided
- Learnability
    - When a user visits the website for the first time, can he/she quickly get started with the basic functions of the website? Therefore, whether the user can quickly learn to use website functions is a metric for learnability.

2.3.2 Efficiency

- The website enables users to easily complete predetermined goals and tasks.
- The learning efficacy of the test exercises can be quickly achieved.

2.3.3 Satisfaction

- Will the user intend to use the website in the future?
- Does the website meet users' information needs for online tests?
- Will the user recommend the website to other people?

The purpose of usability evaluation is to identify the usability problems of the website and then, based on the results of the usability evaluation, to improve the usability of the website and enhance the effectiveness of the website. Therefore, the selection of effective methods and techniques for usability evaluation is the key to the success or failure of the evaluation. The usability evaluation is usually carried out in combination with different methods to explore the symptoms of usability problems from multiple perspectives in order to increase the validity of the evaluation results.

3. Research Design

This study invited five candidates who were preparing for a civil service examination to complete a one-to-one usability test with seven questions as well as a questionnaire survey. Nielsen (2000) concluded that the most cost-effective number of test takers for user testing is five. If the number of test takers exceeds five, fewer and fewer usability problems will be identified, which is a waste of research resources. While "thinking aloud" was used to

test the usability of the website, computer software was also used to record the process of the test taker's operation of the website interface. "Thinking aloud" is used to test people's problem-solving strategies (Erikson & Simon, 1985). During the test task, the application of this method is to ask the test taker to speak out loud what they think and what they are going to do. The researchers can understand the thinking process of the test takers by observing this process and can further analyze and identify usability problems. Finally, the System Usability Scale (SUS) was used to conduct the satisfaction survey. SUS is a widely used, freely distributed, and reliable measurement tool (Finstad, 2006).

Currently, in the structure of candidates applying for the national civil service examination, the female-to-male ratio is about 80:20, and the age of candidates is mainly between 26 and 35 years old. Therefore, in this study, the gender and age sampling of the test takers is inevitably affected by the structure of candidates. All five test takers were between 26 and 35 years old.

The five test takers had never used Company A's online test website. Although they used the Internet for a different number of hours each day, they all had experience using and operating other online test sites. In terms of their information literacy, they generally had web page operation and use ability at a basic level. They had plans to take the national civil service examination in the near future. Thus, they were considered appropriate as a target user group for the online test website.

4. Results

One of the most important typical functions of the online test website is to record the history of users using the test function. Only after a user correctly and quickly accesses his/her member account and password to log into the website can the work of recording all the tests be started. Task I was designed to test whether the user can quickly find the member login function when visiting the website for the first time, correctly complete the member login work, and register a username or nickname for use during website activities. Users' nicknames are used to distinguish users' identities when they enter the website to conduct individualized learning activities, such as displaying the identities of mock test rankings. Because it is not appropriate to display the real name of a member, it is necessary to use a nickname to record and display the score ranking identity. According to observations of test takers' performance on Task I–member login, most test takers successfully completed the member login. Each test taker would naturally look to the upper left corner of the web page after receiving the instructions. Based on people's experience using the website, most users were used to the member login function being placed in the upper left corner of the web page, so the design of member login is in line with the efficiency of this function. However, some test takers were somewhat hesitant in the registration of nicknames. Test taker 2 could not figure out what text to use for a while, so she hesitated for some time. Test taker 3 could not immediately find the input location of the nickname to be registered. Although the text box for the nickname was directly in front of her, she still searched the left and top menus. After test taker 5 entered her nickname, there was no obvious feedback screen in the system, which made her wonder whether the registration had been completed correctly. To resolve these problems, this study suggests that the design should be improved in the future. When the user logs in for the first time, there should be obvious welcome words and nickname registration instructions, with simple nickname examples and an obvious feedback screen after completing the registration.

Task II was designed to test whether the user could correctly and quickly find the required test items for test exercises as well as complete the test items correctly. This part was one of the important functions of the website, which involved use effectiveness. Based on observations of test takers' performance on Task II, in terms of selecting the test items for users' personal needs, all test takers could quickly find the correct test items. However, in terms of how to start the test, not all test takers could immediately understand how to start the test (by pressing the start button). They had to rely on the researcher's assistance or read the instruction text on the web page to figure out that they needed to press the web button to start the simulation test. This web page was originally designed to enable the user to understand the rules of use of the test function. Once the users understand the rules of use, they can press the button stating "Agree to the Above Items and Start the Test." After pressing the button, the button will disappear, but at the end of each subject, the "Start Test" button will be displayed. However, this method seems to have hindered users' use effectiveness.

Test taker 1 thought that the countdown timer took up too much of the screen, resulting in a sense of pressure. In addition, for some test questions with a group of sub-questions, there was no obvious connection between the text of the test question and its sub-questions, so it was easy for the test taker to ignore the fact that the questions were in same group, resulting in a misunderstanding of the question's meaning. Test taker 3 and test taker 5 thought the button to answer the question (i.e., radio button) on the test question web page was too small, so it was not easy for them to click.

To resolve these issues, design should be reconsidered. (1) The countdown timer was originally designed in a simulated test situation, but if it significantly affects the mental state of the user when using it, it may affect the use effectiveness. It is suggested that the proportion of the countdown timer to the entire screen be reduced. (2) A test question with a group of sub-questions should have the same background color as its sub-questions. (3) The button for answer options should be enlarged.

Task III was designed to observe test takers' performance on test question reviews. A typical online test website should have the function of test question review. According to the observation of the test takers' performance on Task III, test taker 2 and test taker 5 thought that the entrance to the test record was not easy to find. This observation also led to the discovery that test taker 2 and test taker 5 mistakenly thought that the function menu at the top of the website was a background pattern rather than a function button, causing difficulty in finding the function menu of the test record item. The design of the path link button was not obvious. In addition, all the test takers believed that, before finding the final test question review web page, they had to go through too many layers of web pages, starting from the test record homepage to the test subject score record (second layer) and the subject test question review (third layer), which caused low efficiency in accessing test records.

Several suggestions are made for solving these problems. (1) Although the art design on the function menu requires ingenuity to make some aesthetic designs, it also needs to take into account users' use habits. A function button must still be designed to look like a button so that users do not mistake it for a background pattern. (2) From the test record web page to the test question review web page, the first and second layers should be integrated to shorten the access process and thereby increase use efficiency.

Task IV was designed to test users' memorability when using the website—namely, whether users can still remember how to use previously used functions after leaving the website and returning once again. According to the observations of the test takers' performance on Task IV, all test takers could quickly complete this task. Thus, the website had obvious and easy-to-remember advantages in terms of the options for test classification items. After logging in once again, the test classification items were displayed after the subjects tested when the user performed Task II, and the text "completed test" was displayed.

Task V tested whether the user, when using the functions of different test modes, could deduce the use method based on the previously used functions (i.e., learnability of the website). On this task, all test takers could successfully complete the exercise test of a single subject. At the same time, test taker 1 also suggested adding anchors to the web page displaying the test questions. An anchor is web page design term referring to the location points of different vertical coordinates in a single web page to facilitate moving up and down the web page quickly. The evaluation metrics for Task VI are the same as those for Task V. Task VI tested whether the user, after using review functions of a certain category of test questions, can use the question review functions of different projects based on his/her previous experience. According to the observations of test takers' performance on Task VI, only test taker 5 could not correctly click to enter the test question review of a single subject immediately. One possible reason is that the domain names of the entrance link texts of the test question reviews did not adopt unified wording, meaning the user could more easily select the incorrect entrance link. The domain names of correct entrances of test question reviews of a single subject were not unified with those of other types of test question reviews in textual terms. Therefore, in the future, unified textual terms should be adopted after conducting a comprehensive review of the terms for the same functions of the website in order to increase the effectiveness of the website.

Task VII is the last action of the user when ending the operation on the website and fully record the time history of personal use of the website. Task VII tested memorability, an evaluation metric of the typical function for the member. The results indicated that all test takers could immediately use the website logout function without hesitation.

After completing the test on usability, all test takers were invited to fill out the SUS satisfaction questionnaire. In terms of overall satisfaction with the website, the above average score was 67, which is close to the average score of 68 in foreign SUS research, but it is still insufficient. Thus, there is still much room for improvement, although there are no major defects in the usability of the website.

In terms of website recommendations, Sauro (2013) discussed the SUS results for 10 events. According to Sauro, the average SUS score of promoters is 82, while the average SUS score of detractors is 67. Three of the test takers scored above 67, which lagged far behind the average SUS score of 82 for promoters. Even worse, two of the test takers scored less than the average SUS score of 67 for detractors. Therefore, in terms of satisfaction for recommendation, Company A's online test website did not receive potential praise from the test takers.

5. Conclusion and Recommendations

According to the problems identified in the test of the usability of the online test website and the analysis of test takers' satisfaction questionnaire responses, deficiencies exist in the design of the usability of the online test website of Company A. In particular, the test takers' evaluation of the website was also close to the detractors' impressions. This indicates that the usability of the online test website does have an impact on the users' status of using the website and their intention to use the website. The metrics for the evaluation on the usability of the online test website are summarized and explained from three orientations, as follows.

5.1 Impact of Effectiveness

Four website effectiveness problems were identified from the test on usability that caused test takers distress.

- The interactivity of the website is relatively insufficient (the screen or message on the web page for feedback is not clear enough). For example, after completing the registration of the member's nickname, there is no obvious feedback screen, which makes the test taker uncertain about whether he/she has completed the registration function.
- The organization of information is not clear enough.
  - Member's nickname registration input location is not obvious.
  - The way to "Start a Mock Test" fails to enable users to get started quickly.
  - There are no unified path link terms.
  - The countdown timer takes up too much of the screen, which affects test takers' the psychology, thereby impeding their effectiveness when answering questions.
  - There is no obvious connection between the text of a test question with a group of sub-questions and its sub-questions, which makes it easy for the test taker to ignore the fact that they are questions in the same group, thereby affecting the effectiveness of answering the questions.
- There is a lack of guidance for correcting errors. For example, there is no sample explanation for member's nickname registration, and the instructions for how to start the test are not simple or clear enough.
- There is a lack of visual appearance. For example, it is difficult to find the link entrance to the member's test record because the function menu is not made like a button, and it is not designed according to users' habits and cognition.

5.2 Impact of Efficiency

Three problems were identified in the test of usability that caused test takers distress in terms of efficiency.

- The button for the answer to the question (radio button) on the test question web page is too small, making

it more difficult for the test taker to click through, thereby affecting the efficiency of answering the questions.

- To find the test question review web page, the test taker has to go through three layers of web pages, which affects the learning efficacy of quickly accessing the test question review.
- When answering the questions on the web page of test questions, the test taker can only use the browser scrollbar to move up and down. The lack of web anchors creates inefficiency for the test taker when browsing the test questions.

5.3 Impact of Satisfaction

Finally, three items were identified in terms of the manifestation of satisfaction—namely, information satisfaction, overall satisfaction, and satisfaction to make a recommendation.

- Information satisfaction: The test takers believed that the basic exercises and test records of the test questions on the website can meet part of the use needs for the online test, but deficiencies remain in the information provision, such as the lack of statistics and exercises for the questions that the test taker frequently gets wrong.
- Overall satisfaction: All test takers believed that the website is still easy to use, and they are confident that they have the ability to use this online test website; they also have expectations in terms of their intention to use the website in the future. However, they also believe that there are some troubles in the use of the website, and the systematic integration of functions is also insufficient.
- Satisfaction to make a recommendation: The average SUS score of the test takers indicated that the website was not well received by the test takers, so they would not recommend it to other people.

To address the problems identified in the test of the usability of Company A's online test website, this study makes four recommendations. First, in terms of the member's nickname registration, when the user logs in for the first time, a clear welcome screen and simple nickname registration instructions should be presented, a simple nickname example description should be added, and an obvious feedback screen should be displayed after the registration is completed.

Second, in terms of interface design, the function menus and buttons should be best designed in a shape or display mode that conforms to the user's cognition and use habits, such as three-dimensional and interactive shape or display modes. The proportion of the countdown timer to the screen should be reduced, adhering to the principle of not preventing the user from answering the questions. Test questions with a group of sub-questions should have the same background color as their sub-questions. Finally, the answer radio button on the question answering web page should be enlarged.

Third, the web page use processes should be simplified and integrated, and the functional text terms should be unified. The website should provide concise and easy-to-understand text so that users can immediately figure out how to use the test functions. From the test record web page to the test question review web page, the first and second layers should be integrated to shorten the access process for increasing use efficiency. On the web page displaying the test questions, anchors should be added to the inner web page link positions to facilitate users' ability to quickly move the web page up and down to read the test questions. Unified textual terms should be adopted for the same functions of the website to increase its effectiveness.

Finally, the website should incorporate different types of test modes. For example, a test mode should be added for the questions that the test taker frequently gets wrong in order to meet the information needs of the individualized test.

A website inevitably includes many design deficiencies when it is initially designed, and these must be identified and corrected through continuous testing. This study evaluated the early usability of an online test website and identified usability problems by testing the website's usability in order to enhance its usability. Once the website design is improved, its usability should be tested again. By repeatedly testing usability, the design of the website

can be continuously improved, gradually reaching the best state until this online learning resource is favored and fully used by users.

5.4 Future Research Directions

Future research should develop an in-depth understanding of the impact of a website's usability on test takers' use of the online test website, focusing on test takers with different learning styles or different identity backgrounds. This study of website usability included students participating in face-to-face classes in a remedial education institution. However, users have many different learning styles, such as non-traditional face-to-face class students who use digital teaching materials or self-study at home or individuals from different backgrounds (e.g., gender, industry, and age). This study did not consider these differences, so future research can include more test takers with different learning styles or identities in order to understanding the impact of these differences while expanding the scope of research on the usability of online test websites. Finally, future researchers can use different evaluation methods to evaluate the usability of online test websites, such as a questionnaire survey method in quantitative research and in-depth interviews, in order to carry out extensive and in-depth evaluation research.

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