Usability Analysis of Online Bank Login Interface Based on Eye Tracking Experiment

Xiaofang YUAN, Mingyan GUO, Fang REN, Feifei PENG
College of Management, Xi’an University of Science and Technology,
No. 58 Yanta Road, Xi'an, Shaanxi Province, 710054, China
Tel.: 8613110471440, fax: 8602985583906
E-mail: 308140261@qq.com

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Abstract: With the rapid development of information technology and rapid popularization of online banking, it is used by the more and more consumers. Studying on the usability of online banking interface, improving the user-friendliness of web interface, and enhancing attraction of bank website, which have gradually become the basic network marketing strategy of the banks. Therefore, this study took three banks as an example to record subjects’ eye tracking data of time to first fixation, fixation duration and blink count and so on by using Tobii T60XL Eye Tracking equipment, while they login online banking web interface, and analyzed that the factors of webpage layout, colors, the amount of information presentation which impacts on the usability of online banking login interface. The results shows that the login entry, account login information and other key control buttons should be placed in the upper left corner to quickly lock the target, and the interface should have a moderate amount of information presentation, the appropriate proportion, reasonable font size settings, harmonious, simple, and warmth design style.

Keywords: Eye tracking, Online banking, Login interface, Usability.

1. Introduction

China Electronic Commerce Research Center monitoring data showed the scale of e-commerce transactions has exceeded 10 trillion Yuan. The rapid development of e-commerce made online banking used widely, so we can stay at home in order to achieve transfer, electronic shopping, pay the bill and so on. “2012 China Electronic Banking Survey Report” displayed our electronic banking showed a rising trend for three consecutive years. In 2012 our proportion of personal banking users net 30.7 %, an increase of three percentage points higher than 2011. Corporate banking user percentage is 53.2 %, year-on-year growth of 9 %, and 40 % of personal online banking users have more than one e-currency account.

In addition, personal online banking service counter alternative rate of 56 %, corporate banking replacement rate of 65.8 %, the number of online banking users still occupies a leading position in electronic banking customers. The current layout of the banks have electronic banking to occupy positions, with the deepening of the banks competition, how to enhance the attractiveness of bank websites and improve user-friendly web interface gradually become a basic marketing strategies of the banks. Hence, study of online banking interface usability to provide users with in line with operating habits, meet the demand of use, fast and convenient banking user interface is very necessary.

The relevant research at domestic and abroad found that currently the academic study of the
availability of the web interface applying scaling method [1], questionnaire survey [2], product evaluations, eye movement instrument method [3], etc. Eye movement technique by which an objective record of human eye movements characteristics when dealing with visual information, reflecting eye movement trajectories of browsing the web, fixation duration, pupil size and other information, to abandon the traditional scale method, questionnaire survey method, evaluation of the subjectivity and fuzziness, is widely used in the field of visual perception, attention, reading research, etc. An Lu, Li Ziyun [4] reported on an experiment of 20 university students, using Smarteye 5.4 to study the subjects’ eye movements in hopes of formulating principles for scientific homepage design.

Finding s from the experiment show that clear navigation, proper layout with the use of sub titles and icons, and presentation of course highlights in the most eye-catching position can help learners find what they need more quickly and effectively; Qin Linchan, Zhong Ning, Lv Shengfu [5] used eye-tracking technology to investigate how the appeals of Web information interact to users' tasks and impacts on eye-movement patterns; adopted emotional appeal and rational appeal to describe information, and participants were assigned preference and matching tasks in the experiment.

The results showed that there were different eye-movement patterns between participants on preference task and on matching task; meanwhile, these differences were impacted by the appeals of the information being watched; Zhang Bing, Zhang Min [6] and Yuan Zheng [7] analyzed the reading behavior of common electronic magazine and newspaper advisements of mobile phone under visual and auditory stimuli by using eye tracking technology and regression model. Yang Huijia and Wang Chensheng [8] researched many domestic mobile banks especially Industrial and Commercial Bank of China, China Merchants Bank, China Everbright Bank.

The research used Cognitive walkthrough, combined GOMS analysis and eye movement analysis to evaluate the usability of the WAP mobile bank interface, process to find out the usability problem in the interface design summing up the user experience guidelines of WAP mobile bank. Moreover, Cheng Jingen, Guo Fu, He Mingrui [9-12] studied the visual selection effect of searching information in E-commerce web page, Web Design for the Middle-aged and the Elderly, increasing availability of knowledge map and the effective factors of billboard advertisements. But the study on the usability of online banking login interface using eye movement technology is still rare. Therefore, this paper analyzed the usability of online banking login interface buy using the method of eye movement experiment and questionnaire survey in order to provide the reference for the marketing tactics of the network bank.

2. Experiment Scheme

2.1. Experimental Subjects

College students were randomly selected as the experiment subjects who have experience in online shopping and using online banking, aged between 20 and 35 years. All subjects were normal or corrected to normal vision, have no color or color weakness and other symptoms, and didn’t use three online banking interfaces of experiment materials. A total of effective participants are 10 people, and the male and female ratio was 5:5. Testing time was the afternoon of January 1, 2014 (14:00-18:00).

2.2. Experimental Materials and Equipment

1) Experiment Materials.

Choose the domestic A, B, C three banks website homepage and personal online banking login interface as test platform, the three banks’ interface design style, Webpage layout, etc is different.

2) Experiment Equipment.

This experiment adopted the Tobii T60XL eye tracking system to collect experiment data, recorded the participants’ eye movement trajectory point and heat maps in the process of performing tasks, and analyzed the time to first fixation, fixation duration and fixation count in the area of interest. At the same time the resonation of online banking login interface were analyzed in visual effects, ease of operation, and other layout arrangement, etc. by the RTA (Retrospective Think Aloud) method and questionnaire survey.

3) Experiment Procedures.

In order to ensure the credibility and validity of the experiment, it is divided into 4 stages of explaining tasks to experiment objects, calibration, formal testing and returning visit. The specific steps are as follows.

a. Explaining tasks to experiment objects.

Registered the objects’ information and explained the experiment task. The objects were given an experimental task list on the screen at the same time.

b. Calibration.

The object sat in front of the eye tracker in comfortable and natural way, and was told: “there will be a red dot on the screen, please use your eyes to track the trajectory of the movement of dots.” in order to conduct eye calibration.

c. Formal testing.

The objects browsed successively the three banks’ official web page interface and personal online banking account login interface, and completed the following tasks: Find and click the entry of personal banking login in the bank’s official website home page interface; input user name (ID number) and password (student number) and other information to complete the login task in personal online banking account login interface.
d. Returning visit.
Inquired the object about the advantages and disadvantages of the three banks' official website home page interface and personal online banking account login interface on these aspects of visual effect, convenient operation and layout arrangement and so on by questionnaire survey and RTA records.

3. Data Statistics and Analysis

3.1. Analysis on the Access of Online Banking Website Homepage Interface

The fixation locuses of A, B and C banks’ official home pages are shown in Fig. 1, Fig. 2 and Fig. 3 respectively.

Analysis on eye movement’s data of online banking official web homepage interface are adduced in Table 1.

Table 1. Analysis on eye movement data of online banking official web homepage interface.

<table>
<thead>
<tr>
<th></th>
<th>A bank</th>
<th>B bank</th>
<th>C bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixation Duration</td>
<td>8.18</td>
<td>11.09</td>
<td>10.65</td>
</tr>
<tr>
<td>Total Visit Duration</td>
<td>17.77</td>
<td>28.68</td>
<td>29.05</td>
</tr>
<tr>
<td>AOI’s Time to First Fixation</td>
<td>3.32</td>
<td>8.57</td>
<td>8.99</td>
</tr>
</tbody>
</table>

According to the analysis on fixation point trajectory diagram and eye movement data of three bank home page, we can see that the span of A bank's gaze trajectories was small, the task was completed in the shortest time and the time to first fixation to the target AOI region was 3.32 s, so it is the most easy to find the target task; Gaze trajectories of B bank and C bank is mixed and disorderly large span, track, the time of completing task was longer, the time to first fixation to target AOI region were 8.57 s and 8.99 s, so the task is not easy to find the target. Therefore, according to most people's reading habits in line with “F” type, the A bank website home page layout is more reasonable.

3.2. Personal Online Banking Account Login Interface Analysis

1) Gaze Trajectories, Heatmap and Clusters Figure Analysis
By comparing the three banks’ gaze trajectories, heatmap and clusters figure of personal online banking account login interface as show in Fig. 4, Fig. 5, Fig. 6, because the subjects were task-driven browsing webpage, we found that the gaze trajectories of three banks were basically concentrated on the range of account login information entry and control buttons, and formed a more concentrated heatmap and clusters figure. Especially the concentration degree of A bank and C bank’s gaze trajectories were higher, clusters Figure (automatically generated according to the fixation point density region of interest) were concentrated on the range of the account login information input and control buttons. The reasons may be due to A bank’s account login information entry and push button located on the top left of the interface position, in line with people’s “F” type reading habits, facilitate the user’s gaze and operating. Though C bank’s account login information interface and control buttons located right position, the left side of the picture is simple, the impact on user operations were smaller compared to B bank. Therefore, C bank had a high concentration degree of gaze.

![Fig. 1. The fixation locus of A bank’s official home page.](image_url)
2) Analysis on AOI’s Gaze Data.
Area of interest was established respectively in registry access and pictures of personal online Banking account login interface, as show in Fig. 7, Fig. 8, Fig. 9, and counted each AOI’s time to first fixation, fixation duration and total visit duration. As show in Table 2, A bank login access’s time to first fixation is the shortest, the easiest to find, but its fixation duration and total visit duration was the longest. May be due to the large amount of information be provided in online banking account login interface, and you need to enter the identifying code led to the extension of time. Secondly the order of login access’s time to first fixation was C bank and B bank, Looking for B bank’s account login interface had the longest time, which is consistent with the gaze trajectories, heatmap and clusters figure analysis.

Fig. 2. The fixation locus of B bank’s official home page.

Fig. 3. The fixation locus of C bank’s official home page.
Fig. 4 (a). A bank’s gaze trajectories analysis.

Fig. 4 (b). A bank’s heatmap analysis.

Fig. 4 (c). A bank’s clusters figure analysis.
Fig. 5 (a). B bank’s gaze trajectories analysis.

Fig. 5 (b). B bank’s heatmap analysis.

Fig. 5 (c). B bank’s clusters figure analysis.
Fig. 6 (a). C bank’s gaze trajectories analysis.

Fig. 6 (b). C bank’s heatmap analysis.

Fig. 6 (c). C bank’s clusters figure analysis.
Fig. 7. A bank’s AOI.

Fig. 8. B bank’s AOI.

Fig. 9. C bank’s AOI.
Table 2. Analysis on gaze data of personal online Banking account login interface AOI.

<table>
<thead>
<tr>
<th></th>
<th>A bank login access</th>
<th>A bank picture</th>
<th>B bank login access</th>
<th>B bank picture</th>
<th>C bank login access</th>
<th>C bank picture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time to First Fixation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>13.11</td>
<td>36.76</td>
<td>16.34</td>
<td>22.05</td>
<td>14.55</td>
<td>21.54</td>
</tr>
<tr>
<td>Sum</td>
<td>131.13</td>
<td>330.86</td>
<td>163.42</td>
<td>154.37</td>
<td>130.91</td>
<td>215.44</td>
</tr>
<tr>
<td><strong>Fixation Duration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>287</td>
<td>26</td>
<td>213</td>
<td>54</td>
<td>188</td>
<td>82</td>
</tr>
<tr>
<td>Mean</td>
<td>0.21</td>
<td>0.17</td>
<td>0.21</td>
<td>0.2</td>
<td>0.19</td>
<td>0.17</td>
</tr>
<tr>
<td>Sum</td>
<td>60.29</td>
<td>4.43</td>
<td>45.08</td>
<td>10.55</td>
<td>35.74</td>
<td>13.58</td>
</tr>
<tr>
<td><strong>Total Visit Duration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>22.1</td>
<td>0.54</td>
<td>13.55</td>
<td>2.25</td>
<td>15.81</td>
<td>2.65</td>
</tr>
<tr>
<td>Sum</td>
<td>221.03</td>
<td>4.84</td>
<td>135.47</td>
<td>15.73</td>
<td>142.33</td>
<td>26.49</td>
</tr>
</tbody>
</table>

Table 3. Subjects’ blink on three bank account login interface.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>74</td>
<td>22</td>
<td>96</td>
</tr>
<tr>
<td>B</td>
<td>31</td>
<td>16</td>
<td>47</td>
</tr>
<tr>
<td>C</td>
<td>23</td>
<td>18</td>
<td>40</td>
</tr>
</tbody>
</table>

3) Blink analysis.

The subjects’ blink was calculated by a formula in Excel during the experiment in three banks, as shown in Table 3. The maximum number of visible blink was A bank, the blink of C bank was the least, to further illustrate A bank’s the interface layout was in line with the people’s regular browsing habits, but its design was too complex, and a large amount of information was presented led to more interference on the subjects’ operation; C bank’s interface settings was most simple and clear, easy to understand and operate, so the amount of blink was least.

3.3. Analysis on RTA Records and Questionnaires

Through interviews with survey results and analysis of RTA, we found that A bank’s official web page login entry is the most reasonable design, easy to find the target, and in line with people’s “F” type reading habits; but A bank’s online banking account login interface test is generally considered its interface is too complicated, too much information, and also need to enter a identifying code. The overall feeling of B bank’s online banking account login interface was the best because of concise, clear and warm settings, moderate amount of information, clear navigation, easy to read and operate; C bank’s online banking account login interface for most subjects were considered too simple, and the font was too small, inconvenient to read and operate.

6. Conclusion

1) A reasonable online banking login interface which attracts customers and easily accepted by customers should be based on most people’s “F” type reading habits, and the login entry, account login information and other key control buttons placed in the upper left corner, and it is convenient for the user to quickly lock the target.

2) Online banking account login interface which is set in consideration of safety at the same time, should consider the convenience of the user operation, stick out a mile, a moderate amount of information presentation, the appropriate proportion, reasonable font size settings, design style tends to be harmonious, simple, and warmth, comfortable and fresh colors, more conducive to the user acceptance.

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References


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