Usability Study

Executive Summary

The PMDS application developer commissioned a team of usability experts to conduct usability tests on various pages of the PMDS application system. The objective of the tests was to find ways in which to improve the application usability.

The tests consisted of two expert evaluations and a user testing session. The expert evaluations consisted of a Heuristic Evaluation and a Cognitive Walkthrough. A panel of three usability experts was used to conduct this testing. The user testing was conducted according to the GOMS Model guidelines and it used four randomly selected users from Rush Hospital’s staff and patients. During the testing, the participants attempted two common user specific (tasks differed based on the type of user on the application patient, doctor or board member) tasks, for a total number of six tasks, using the current version of the PMDS system that was being test and the task times, task success and the path that participants took towards success or failure were recorded. At the end of the tests, participants rated the current PMDS according to eight parameters – Product Design, Ease of Learning, Ease of Use, User Interface, Ease of Navigation, Terminology, Intention to Buy and Ability to Use Without Training.

Introduction

This report describes and presents the results of the usability tests that American Health Institutes for Research (AHIR) conducted for PMDS Corporation. The objectives of the tests were to establish quantitative and qualitative measures for a sample of basic tasks using the PMDS system. These measures were then used to test the PMDS system.

For the user test, AHIR recruited a total of 6 individuals, 2 patients, 2 doctors and 2 board
members, 2 Novices, 2 Beginners and 2 Intermediates, to participate in the study. The participants were asked to come in for 20 minutes to perform approximately 2 tasks per user category with "the patient to doctor application". After the test session, participants completed a product survey.

**The Test Method**

**The test design**
The recruiting screener asked participants how long they had been using a personal computer, which versions of Microsoft Windows they had used, how often they used their computer at work or home, and if they had used a similar patient to doctor system. All of the participants completed 2 PMDS application-related tasks. The wording for each of the tasks was the same for all users, with category specific modifications. These tasks were: PATIENT: 1. Log in as patient once registered, 2. Send main physician a message, DOCTOR: 1. Log in as doctor once registered, 2. View patient information, BOARD MEMBER: 1. Log in as board member once registered, 2. View pending patient information.

**The computers**
The computer used had the following attributes:
- Dell Inspiron 600M Series with external mouse
- Intel Pentium M 1.6 GHz processor
- 512 MB RAM
- 1024K Level 2 cache
- 30 GB hard drive
- 32x IDE DVD-CD-ROM
- Diamond Viper 330 AGP video card
- 104-key keyboard and Microsoft Intellimouse® pointing device
- 15" monitor running at 1024x800, 24-bit color
- Dell Wireless 1350 Internal Wireless (802.11b/g, 54 Mbps)

**Test procedure**

Participants came to the usability lab at AHIR for the test sessions. The participants were brought into the testing room, and the pre-test instructions were read out. To ensure consistency, each participant was read the same instructions in the same order. The participants were not told who was funding the test.

During the session, the administrator sat in the observation room, on the other side of a one-way mirror. Participants were led through the session using an intercom, but were not offered any assistance or hints. The procedure for each task was as follows:

- The participant turned over the task sheet and read the task aloud.

- When they were ready, the participants informed the administrator that they were beginning the task.

- As the participants worked through the task, the path they were taking to complete the task was recorded.

- Participants were not asked to speak aloud as they completed the tasks.

- Participants indicated when they were finished with a task. At this point, the task time and whether the participant was successful or unsuccessful were recorded.

- If participants said they could not complete a task and indicated they wanted to go on, they were given the option of continuing with that task, or going on to the next task. If
they quit and proceeded to the next task, the task was recorded as a failure with the maximum allotted time.

- If the participant could not complete a task in the allotted time, they were asked to proceed to the next task, and the task was recorded as a failure.

When the participants were through with all of the tasks, they were asked to complete a Product Satisfaction Survey based on their experiences with the PMDS system. The survey probed perceptions of usability, aesthetics, and satisfaction.

Participants were then paid $150 for the session.

**Findings**

**I Task performance data**

The primary performance data consists of the number of tasks successfully completed and the time taken to complete the tasks. The data reported are summaries over all of the common tasks. Both of these measures have similar trends. For both measures, performance is equally satisfactory.

**a) Task Completion rates**

The following table shows the average percentage of the common tasks completed with each category:

<table>
<thead>
<tr>
<th>Table1</th>
<th>Patient</th>
<th>Doctor</th>
<th>Board Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Statistical analysis of the above data shows that the percentage of successfully completed tasks in each category was highest.

**b) Task times**

The following table shows the average task time for common tasks in each category.

<table>
<thead>
<tr>
<th>Table2</th>
<th>Patient</th>
<th>Doctor</th>
<th>Board Member</th>
</tr>
</thead>
</table>


The following table shows the predicted average task time for common tasks in each category.

<table>
<thead>
<tr>
<th>Table2</th>
<th>Patient</th>
<th>Doctor</th>
<th>Board Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>3 minutes</td>
<td>2 minutes</td>
<td>5 minutes</td>
</tr>
</tbody>
</table>

**II Product Survey**

At the end of each test session, the participants were given a short, nine-question product survey. Each question used a seven-point rating scale. The scale for the first six questions was from **Very Dissatisfied** to **Very Satisfied**, with seven being **Very Satisfied**. Those questions asked participants to rate:

1. Overall product design
2. Overall ease of use
3. Overall ease of learning
4. The appearance of the interface
5. Ease of moving around in the interface
6. Terminology on menus, labels, help, and so forth.

The scale for the last three questions was from Disagree to Agree, with seven being Agree. The questions asked were:

7. I would buy this product if offered at a reasonable price.
8. This product possesses substantial improvements over similar products I have seen or used.
9. I could effectively use this product without additional training, help from others, and so forth.

The higher the rating, the more favorable it is.

The following table summarizes the mean ratings for the nine questions, across the three categories of users:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Patient</th>
<th>Doctor</th>
<th>Board Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Design</td>
<td>7</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Ease of Learning</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>8.5</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>User Interface</td>
<td>9</td>
<td>8.5</td>
<td>9</td>
</tr>
<tr>
<td>Ease of Navigation</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Terminology</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Improvements</td>
<td>8</td>
<td>7.5</td>
<td>8</td>
</tr>
<tr>
<td>Intention to buy</td>
<td>5</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Use without training</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Average Satisfaction</td>
<td>7.55</td>
<td>7.5</td>
<td>7.8</td>
</tr>
</tbody>
</table>

**III Expert Testing**

**b) Heuristic Evaluation**

These evaluations were conducted according to Jacob Nielsen and Rolf Molich’s Nine Heuristics Table:

- **Simple and natural dialog** - Simple means no irrelevant or rarely used information. Natural means an order that matches the task.
• **Speak the user's language** - Use words and concepts from the user's world. Don't use system-specific engineering terms.

• **Minimize user memory load** - Don't make the user remember things from one action to the next. Leave information on the screen until it's not needed.

• **Be consistent** - Users should be able to learn an action sequence in one part of the system and apply it again to get similar results in other places.

• **Provide feedback** - Let users know what effect their actions have on the system.

• **Provide clearly marked exits** - If users get into part of the system that doesn't interest them, they should always be able to get out quickly without damaging anything.

• **Provide shortcuts** - Shortcuts can help experienced users avoid lengthy dialogs and informational messages that they don't need.

• **Good error messages** - Good error messages let the user know what the problem is and how to correct it.

• **Prevent errors** - Whenever you write an error message you should also ask, can this error be avoided?

The following are the overall conclusions from the three heuristic evaluations conducted by our usability experts.

1. **Simple and natural dialog**
   
The PMDS interface lacks in information for the user. Some steps of the application are relatively complicated and the user needs some information to rely upon in case of emergency. Otherwise, the information and the order provided do match the tasks.

2. **Speak the user's language**
   
The system is not yet fully adapted to the hospital care environment. It might help to add industry specific words in order to create a more adaptive interface.

The interface takes for granted some steps of the application. It assumes that every user, especially patients would know what a “login” is and does. On the other hand the
tasks within the application are conveyed in simple language and are easily understood by the user.

There should be a description for all tasks involved in this application. Perhaps a help button could help display further information about a section of the interface or a task.

3. **Minimize user memory load**
   
The PMDS interface needs to minimize the user memory load more. This application helps the user focus on other tasks by remembering and displaying their personal login information. The layout of the interface also stays the same so the user does not have to relearn where everything is every time it goes to a different page or task. But once the user moves on to a different task, there is no record of what prior tasks the user just completed.

4. **Be consistent**
   
The navigation is consistent and the color scheme and graphics stay the same assuring the user that she or he is still in the same application. This consistency could be slightly altered in order to let users know where they are or for what they are there. The patient would rarely need the option to login as a doctor or a board member, thus the navigation should be specific to each one of the three types of users.

5. **Provide feedback**
   
There is barely any feedback as to where the user is in the system. There should be carefull titles for each page so that the users knows exactly where they are.

Besides the “hello” message that the user gets from the interface once she or he logs
in, there is no other message acknowledging the user’s completion of any task. Page titles and clear marks of where the user is in the system are also missing.

6. **Provide clearly marked exits**

The logout button helps an application the most by giving the user a clear way out of the system and in PMDS’ case the application usability is hurt by not having such an option at all. The user does not know what to do and if it is secure to just close the browser. This is not secure and it confuses the user.

7. **Provide shortcuts**

The PMDS application is direct about what every step means. Since it is an online application, it does not have the liberty of including keyboard shortcuts to several key tasks, but the navigation helps in this respect.

There are no ways to undo the most recent task. User might need that.

8. **Good error messages**

The error messages on the PMDS site were unsatisfactory. The error “login” message could have been more friendly. It does not tell the user anything about what it can do to rectify the problem. The only option available is to try again or reregister.

There is not enough flexibility to allow user to make errors. However, the errors that might occur at login stage should be supported by concise but descriptive messages as to what the problem is and what the user or interface can do to fix it. The doctor login does not even allow for the doctor to register and neither does the board member one.

9. **Prevent errors**
The application is relatively simple to use and it does not allow for many errors. Unless the error is a technical one on the application’s side, the user seems to always have clear options of where to go next.

Since there is only one major error that could occur, there should be a warning about wrong passwords and ways in which it can be retrieved in case one forgets it. Perhaps the interface could point out to an email sent out after registration, which contained the user information.

b) Cognitive Walkthrough

This does not test the real users on the system. But the walkthrough is an evaluation tool that helps AHIR apply its design expertise to the evaluation of the interface. This helps identifying problems that a greater number of users would have and it does not concentrate on unique problems that few might have.

1. Will users be trying to produce whatever effect the action has?
2. Will users see the control (button, menu, switch, etc.) for the action?
3. Once user find the control, will they recognize that it produces the effect they want?
4. After the action is taken, will users understand the feedback they get, so they can go on to the next action with confidence?

The following are two select tasks, which were most common across the three categories of users of the PMDS application:

Task 1

Task: Logging into the patient side of the application.

Users: Patients

Interface: Home page of PMDS system displaying the username and password
Correct action sequence: Load page; click text box next to “Username” label; type the username; click or tab to the text box next to the “Password” label; type in the password; tab to “Login” button and press the “Enter” key or click the “Login” button; if login successful, the patient home page loads; if login not successful, an error message is displayed.

Walkthrough:

Can a novice computer user that has used the internet in the past to navigate and view pages come to this page and begin to login? Perhaps the user could not. A novice user that has never logged into another website will most likely not know what to do when loading this page. Instructions of either how to start (“type in your username and password and then click the “Login” button”) might be necessary. If the user knows about logging in from experience, the fact that the “Username” label is placed right after the box might confuse the user since the reading from left to right will make the user think that the label should precede the appropriate text box. This problem might arise even if the initial instructions are present.

The text boxes are self explanatory even for the novice user who is prompted to click the box and start typing. The “Login” button is also evident, especially after reading the instructions but there might be a problem with the nature of the password text box. Since it is set to take a password, it shows every symbol entered as a bullet and the user cannot be absolutely sure he or she typed in the right combination. If the password is wrong, an error message is displayed. It is good that the user sees something happened, but it is not enough. The message needs to be helpful in order to lead to the successful login.
The only error message is “Invalid Login or Password”. It should direct the user to an error reporting task, to re-enter the username and password or to a password reset task.

**Task 2**

**Task:** Patient to send message to doctor.

**Users:** Patients

**Interface:** Patient page of PMDS system displaying the username user information in the center, list of messages on the right with “send message to doctor” label, doctor selection drop down list, message text box and “submit” button below.

**Correct action sequence:** Once logged in, click drop down next to “is your primary physician” label, select primary physician, click message text box, type in the message and click the “submit” button.

**Walkthrough:**

The users are guided well by the “Send message to Doctor” label and that will focus their attention the appropriate section of the interface.

The drop down menu containing the name of the primary physician should contain names and not numbers in order for the users to realize that this is where they pick their doctor. The label is useful but there would be confusion as to what the numbers signify. Once the doctor is selected then moving on to the message box would create confusion. Even though it is the only text box, the text box is not labeled and the users might not see this control.

Once the message is typed in and submitted, there is no feedback at all from the interface letting the users know that the message has been sent and that the doctor has received it.
The message list above these controls does not update. If this list is meant to show the messages between the user and his or her doctor then it would need at least labels showing who sent the messages listed. Then it should also refresh once the message was submitted to show that the message is actually posted.

**Conclusion**

From the task performance data and the participant product satisfaction ratings, we see that:

- The average number of tasks successfully completed was the highest all three categories
- The average time taken to complete the tasks was proportionally increased from the predicted value to the actual value of each time. This was valid for all three categories
- The average product satisfaction rating was the highest for Board Member category
- The average product satisfaction rating for the Patient Doctor categories were almost the same although differing from question to question

In summary, from the results of this study, we conclude that the PMDS application needs to be revisited and redesigned to meet more usability needs for all three types of users. The survey also showed that this product has significant potential for sale in the healthcare industry.