VirtualTrials.com

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Abstract

We have chosen VirtualTrials.com as it was the perfect candidate to apply human-computer interaction theories and analysis. The website provides our group with the platform as we find that we can significantly improve the user interface of the website to make it more accessible. VirtualTrials.com’s interface has not been evaluated for a period of time and we believe the usability testing, task analysis, and recommendations would improve the traffic to the website. The purpose of this analysis is not to discredit the website. Our group strives to provide suggestions and improvement to complement the good cause that Musella Foundation wishes to provide to the public with access to the latest clinical trials for brain cancer and tumors.
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1.0 Introduction

The Internet, although its life has thus far been relatively short, has been changed and improved a lot of times in a lot of different ways over its years. Design changes based on users, and users change all the time. Different social trends or different norms assumed by a culture can affect and even completely change the way that people perceive and navigate websites. We chose to analyze the website VirtualTrials.com, a medical website dealing with Clinical Trials and Noteworthy Treatments for Brain Tumors. We use task analysis to predict time it takes to complete tasks on the website, as well as to spot design flaws in computer systems where most users observed make the same errors or struggle to find a target. We conducted a usability testing study for which we asked the users to peruse the website and find what they thought to be the most commonly used and useful links. These results helped us to determine what targets should be the most easily accessible and are candidates for links to reside on VirtualTrials.com’s homepage. Using different forms of the task analysis, we were able to gain insight on multiple aspects of the website’s functions from multiple perspectives. Things like placement, color, size, and title of different links and buttons on the website are under review, and show room for improvement.

1.1 Background

Founded by Al Musella, DPM, VirtualTrials.com hosts a wide array of trials available for brain cancer and tumor. The website primarily collects information from patients over the internet. Once information is collected, VirtualTrials.com will analyze the information
and compile the data that is readily available for further references. Without incurring any cost, participants of the website could share information, update treatments details, and details of their treatments are kept in confidence. The website also provides patients or participants with the latest news on the trials and the option of finding the right treatment in different parts of the world. Other than providing information to patients or participants, VirtualTrials.com also collects funds needed to support this project.

Essentially, the purpose of the website is to provide users with the right information and an interface to explore the possibilities of new trials and treatments available.

1.2 Current State

The website VirtualTrials.com was founded and launched in 1993. VirtualTrials.com was funded by the Musella Foundation and was created by World Wide Websites. In this era, asterisks were used to bold words and links in an older version of the HTML language. It seems that the asterisks are still used but instead are used to indicate the importance of certain links. There is nothing on the page that serves as a legend in regard to the use of the asterisks. Figure 1 shows the current state of VirtualTrials.com.
Figure 1. Current state of virtualtrials.com.

Nowadays, in HTML5, we would clean up those asterisks and make use of more effective tools to indicate significance. Also in HTML5, there are features that would help improve the overall look of the site, as well as the usability. There is a way of designing websites now called “responsive website design” where the page changes based on the size of the window, or if the website is accessed via mobile device’s browser. This is implemented to a degree currently, with VirtualTrials.com having a condensing menu navigation bar at the top of the page when the browser size is changed horizontally.
1.3 Goals

The goal of assessing this website is to analyze the Musella Foundation’s website, VirtualTrials.com and identify usability problems. We have learned about the essential functions of the website and have identified potential problems in relation to them. Our goal is to provide solutions that will help create a more usable and visually appealing website. The problems we found will be clearly identified and supported through testing and relevant research. We hope the recommendations we propose will be considered by the websites creators and hopefully implemented in the future.

2.0 Usability Evaluation

When the usability testing study was conducted, we focused mainly on pattern usage and user experience. We found similar results from many of the participants when asked to determine what links and features of the website could be the most useful and most commonly needed or looked for when coming to VirtualTrials.com after the users had time to familiarize themselves with the website in its entirety.

2.0.1 Pattern of usages

These include information on how to donate to the Musella Foundation, how to contact the website owners with questions or ideas about the website’s content, access to frequently asked questions, the Common Brain Tumor Terms, and access to information about the most recent breakthroughs in Brain Tumor trials as well as the most recently updated trial. These, however, were not participants who have existing knowledge about
what information is needed to properly understand and care for a brain tumor patient’s needs, but it is our best guess concluded from the observation. Al Musella was then contacted by our team and asked what he thought the most useful and popular links on his website are. He stated that the Guide For the Newly Diagnosed, the Newsletter, and the Video Library are accessed the most frequently and contain the most widely desired information on his website. We can observe patterns using the usability evaluation, and then use that in our task analysis to suggest any improvement needed for features that are frequently accessed. Utilizing two key methods of usability analysis we are able to do a more in-depth analysis of the website.

2.0.2 User Experience

Apart from the pattern of usages, we also focused on the aspect of user experience. Our test subjects found that the overall experience of using the interface unsatisfactory. The website was hard to navigate and very non-intuitive.

2.0.3 Usability Analysis By Comparison

The central idea of usability, in all forms, is user-focus. Agre (2005) stated in his paper *How to be a Leader in your Professional Field: A Guide for Students in Professional Schools* to talk to the people who use your profession’s products and services, especially the leaders. Although this concept cannot fully be implemented in this situation, we can say that this leadership quality is useful in designing interfaces, because knowing who your user is and what they are looking for is key in interface design.
Knowing what the most used websites in the world is good to compare to because it shows what the majority of users are familiar interacting with everyday. According to Alexa.com’s (web information company) top 500 sites list, the top four most popular sites are Google, Facebook, YouTube, and Yahoo (2013). All four of these websites have similar characteristics. A simple design that responds to the size of the device that you are using, a categorized list of links located on the left side and the top of the page (i.e. home, news, mail, profile, and etc.), and included links for the most popular features of the website or features that are trying to be advertised by the owners and webmaster. The list goes on, but one thing to keep in mind is that, although these are standard characteristics of websites, it is never a bad idea to go out of the way to put your own personal touch on the webpage. This makes the webpage unique from the rest.

What does this all mean in relevance to VirtualTrials.com? When using VirtualTrials.com, we see that there are style features and styles that are outdated compared to other current medical websites as well as other popular websites. The white space located on the right side of the page (visible on larger sized screens), and organization of “Newly Diagnosed Brain Tumor (Brain Cancer) Patients and First Time Visitors” (Home Page) are just a few things we have seen in terms of style and features.

2.1 Perceptual Analysis of VirtualTrials.com

From the perceptual interaction analysis, we were able to suggest some critical changes for easier navigation. Users’ perceptions are important to consider when designing an interface. The perceptual interaction analysis will provide the necessary changes that will
help improve the interface. By testing the website, we were able to identify some features that need attention.

2.1.1 Color Scheme

Some of the lists on the VirtualTrials.com website are hard to read and simple to lose your place. If the links alternated in text color or background color it could be easier to differentiate each line from the previous and following lines. Having a lot of the same color text directly next to each other is one of the things we found to be a distractor and leads to poor reaction time when searching for a target.

On VirtualTrials.com, there is a list of links with brain cancer related articles. These links are colored purple while the asterisks are colored red. (Figure 2) When scrolling through the links, the colors seem to blend more than compliment. This is not good to have, especially since asterisks are used to point things out. Not only do the colors blend, the objects (letters and symbols) are together with no space in between making it harder to detect. If objects are separated, it is more readable for users if each object is in a different color or some type of clear division between the two. When publishing these list style pages, VirtualTrials.com could consider applying some of these concepts.

Figure 2. Example of virtualtrial.com updates.
2.1.2 Placement of Objects

Another way a user perceive the website is predictable placement of objects on the website. VirtualTrials.com does not take in consideration of how a user perceive the placement of useful information on a website. For example, VirtualTrials.com placed information of the officers on the left side which most users would perceive to be vital information such as links to how to contact the person in charge of the website, on-going trials, or news and updates. While contact information of the officers could be important for some users, the goal of the website is to provide or satisfy a user’s needs to seek information about any forms of treatments or breakthrough news on brain tumor. Things like the officers and advisory board do need to be on the website, but they do not need to be on the main page of the site. This kind of information can be placed in the about page in more detail with biography of each person. Our team believed that to be able to meet the needs of the visitors to the website, VirtualTrials.com should put more emphasize on the links to more information by having a predictable placement, color that distinguishes the links from other texts on the website to help in controlling user’s attention, and include more cues to facilitate in navigations of the website.

3.0 Task Analysis

3.1 Methodology

3.1.1 GOMS

The first goal involves finding and highlighting the direct contact number on the website. This information can be found on the “Contact Us” page. At the top of the home page there is navigation bar with sub menus; “Contact Us” being stored under the “Interact”
menu. On this page, the user is asked to locate the “Direct Contact Number” and highlight it. The steps necessary to achieve the goal are listed in Table 3-1.

Method 1 for goal: Find Direct Contact Number
Step. Look at task bar located at the top of the page
Step. Hover over “Interact”
Step. Click “Contact Us”
Step. Locate direct contact phone number
Step. Highlight direct contact phone number

Table 3-1. GOMS Model - Finding Direct Contact Number
For our second task we will have the users and ourselves navigate the home page to find the most recent trials added or updated on the website. There is a category on the top navigation bar called “Find A Treatment” which has a sub-category “New Trials Listings”. By clicking on the link, a list of the most recently added and updated trials comes up with the NCT numbers as links on the left hand side. Using these links the user can read all of the available information regarding that specific trial for all locations it is offered. The user is asked to click on the first link opening the description for the first and most recently updated trial on the website. The tasks could be organized into the following Table 3-2.

Method for goal: Find the most recently updated trial information
Step. Hover over “Find A Treatment”
Step. Hover over “New Trials Listings”
Step. Click “New Trials Listings”
Step. Locate “Last Updated” column
Step. Click most recently updated trial NCT link code

Table 3-2. GOMS Model - Finding the Most Recent Clinical Trial

3.1.2 Keystroke Level Model
Our team has applied the Keystroke Level Model on each individual goal and analyzed the tasks needed to achieve the goals. To create the Keystroke Level Models we went through the tasks and broke them down into specific simple tasks creating an easy to follow method. The first goal of finding direct contact number consists of different tasks such as keystrokes, pointing, and homing. We have predicted that the total amount of time taken would total to 14.16 seconds. The list of tasks is analyzed and predicted using Keystroke Level Model in Table 3-3.

### Method
1. Find the “Interact” menu on the navigation bar $M$
2. Point to “Interact” $H$[mouse] $P$
3. Find “Contact Us” $M$ $P$
4. Click on “Contact Us” $K$ [Click]
5. Find direct contact number. $M$
6. Point to direct contact number $H$[mouse] $P$

Time predictions

$$T_{execute} = [2t_H + 3t_K + 4t_P + 1t_D] + 3t_M$$

$$= [2(0.4) + 3(0.15) + 4(1.1) + 1(4.46)] + 3(1.35)$$

$$= 14.16 \text{ seconds}$$

**Table 3-3. Keystroke Level Model Prediction for “Finding and Highlighting the Direct Contact Number”**

For the second goal, we have users go on VirtualTrials.com to look for the most recent clinical trial. The second goal involves numerous tasks that involve pointing, homing, and keystrokes to be completed before accomplishing the goal. Our team has estimated the total time for execution to be 15 seconds. The Keystroke Level Model for this goal is listed in Table 3-4.

Interacting with the different parts of VirtualTrials.com is a necessary and important part of successfully gathering relevant information. In this Task Analysis, we are analyzing
the specific tasks needed to be completed to achieve certain goals. As a group, we assumed and selected two goals that users are most likely to achieve on VirtualTrials.com. These goals include navigating the website to find and highlight the direct contact phone number and to search for the most recent clinical trial available on VirtualTrials.com. The GOMS (Goals, Operations, Methods, and Selection) analysis interprets these necessary steps taken to achieve these goals and provides insights on how certain goals can be accomplished faster by simplifying certain tasks. In addition to that, we will also apply the Keystroke Level Model to compare the time taken by individuals to achieve these particular goals. By analyzing the steps and tasks used to complete the two goals we have created, we hope to learn more about how users complete certain tasks on websites.

**Method**

1. Find the “Find A Treatment” menu on the navigation bar **M**
2. Point to menu to see drop down menu **H**[mouse] **P**
3. Find “New Trials Listings” located in drop down menu **M**
5. Click on “New Trials Listings” **K**[mouse down]
6. Find the “Last Updated” column on the table **M**
7. Scan the list of options for the most recent trial
8. Find the “NCT” column on the table **M**
9. Find the most recent trial’s NCT code **M**
10. Point to the most recent trial’s NCT code **H**[mouse] **P**
11. Click on the NCT code **K**[mouse down]
12. Time Predictions

\[
T_{\text{execute}} = [3 \ t_H + 2 \ t_K + 3 \ t_P] + 6 \ t_M \\
= [3(1.1) + 2(0.15) + 3(1.1)] + 6(1.35) \\
= 15.00 \text{ seconds}
\]

**Table 3-4: KLM Prediction for “Finding the Most Recent Clinical Trial”**

When conducting trials for these tasks, our users were set up with a 15” Unibody Macbook Pro running Windows 7 with internal keyboard and track pad. The program
RUI (Record User Input) was used to record our subjects’ actions. The program was helpful in gathering exact times for mouse movement, between button presses, and observing time spent not touching either the mouse or keyboard indicative of mental activity in the working memory of the user. The user was started on VirtualTrials.com home page with the mouse in no particular position. The instructions were given to the subject prior to the start of each task. They were asked to study the steps and remember the order to the best of their ability. The steps were available for reference during the trials for each participant. Each of the participants is college students who are familiar with internet browsing and information seeking.

3.2 Data Analysis

For this website we decided to make finding contact information and finding the most recent trial our goals because we deemed them important functions to the website. This is because the website does not have the most advanced layout and people may want to contact the website for help, and because being able to find the trials is one of the websites main functions. To ensure consistency in our analysis, our group has decided to analyze the specific tasks needed to reach the two goals we proposed.

Based on the Keystroke Level Model, our team has predicted that the time taken to achieve the first goal would take 14.16 seconds. We compared the times we recorded for the users to follow the steps that we prepared, to the predicted time it would take the user to complete the goal. The first goal of finding and highlighting the direct contact number listed on the website’s “Contact Us” page took the users an average of 9.541 seconds.
The Keystroke Level Model suggests that we should have taken 14.16 seconds to go from the first step to the last step of the proposed goal. This shows a big difference in the predicted and actual time to complete the goal.

The second goal was to find the most recent clinical trial on VirtualTrials.com. Using the Keystroke Level Model our team has predicted the time taken to achieve the goal would take 15.00 seconds. Using the data we collected from the users completing the second goal, we calculated the average time to complete the goal to be 10.035 seconds. The difference between our predictions and the user’s real times show a significant gap between the predicted and actual time to complete the task. The consistency of differences between the real data and predicted data suggests that the Keystroke Level Model does not correctly predict and analyze tasks performed by users.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Predicted Time (s)</th>
<th>Average Actual Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>14.16</td>
<td>9.541</td>
</tr>
<tr>
<td>Task 2</td>
<td>15.00</td>
<td>10.035</td>
</tr>
</tbody>
</table>

Table 3-5: Comparisons between Predicted Times and Actual Times

3.3 Summary

The predicted times came relatively close to the observed times for our team members and test subjects to complete these tasks. The result contradicts our former expectation of having a longer real time compared to the predicted time from the Keystroke Level
Model. The shorter observed times were mainly due to users getting familiar with the GOMS analysis. The steps were clearly defined before completing the goal and the users were able to accomplish their goals with ease. We observed that the actual time spent pointing the mouse was similar to the predictions, but actual difference results from more time spent on the execution of tasks instead of the mental operators.

The reason the time spent pointing was more accurate while the time spent processing mental operators is not as accurate is because there is a non-physical pointing process happening mentally that we are forced to record as mental operations. We discovered in our observations that a user may essentially click on the target mentally before actually picking up the mouse for the first time to home the desired location. This caused some discrepancies in the total time taken to complete tasks. The tasks are very straightforward, giving exact instructions to complete each task adequately. The result proves that GOMS is an appropriate tool to introduce an error-free and expert performance to the users even though they are not acquainted with the tasks.

### 4.0 Recommendation

According to Nielsen (2002) the home page is an invaluable part of your website that gets more views than any other page on the website. Typically the homepage is the first page of the website the user sees. It is often used to create one's opinion of the website and to determine whether its trustworthy, up-to-date, and whether or not it contains quality information. A poor homepage design can cause someone to be discouraged from continuing into the websites content solely for the fact that it is not visually appealing.
4.1 Reorganizing VirtualTrials.com’s Homepage

To start the reorganization we recommend to move the introduction already existing on the website to the top of the homepage. Currently the introduction is towards the bottom of the homepage and is hard to find with all of the differently formatted links and information surrounding it. Having the introduction on the top of the homepage makes it easy for first time visitors understand what this website contains and what it can offer them. We also recommend that the awards and accomplishments section on the homepage be slimmed down and added to the introduction. We propose to get rid of the pictures for the rewards and accomplishments as well because they often distract users from the more important information surrounding them. Only the most important and recognizable awards, and mentions of VirtualTrials.com from notable books should be included in the introduction. This is because someone who is new to the website may question the website’s validity and whether or not it is a trustworthy source or not and having the awards in the introduction would help deter someone’s doubt of the validity of the website.

Next we recommend having the Important links section that contains some of the links with descriptions currently on the homepage such as Newsletter, Guide For The Newly Diagnosed, Find a Clinical Trial, Survivor Stories, and Video Library. The ones to be included should be the links to the most used parts of the website. This will help users easily find what they are looking for and be a lot more aesthetically appealing than the current format of important links scattered through the homepage. Next we propose a
“Recent News” section that will display ten of the latest news links. Currently, VirtualTrials.com has recent and important news links scattered throughout the upper part of the homepage. Besides being scattered, these links also have a varying amount of asterisks in front of them which further distract the user from useful information. Displaying only ten of them will unclutter the homepage and help users find recent news when they want to instead of being thrown in their face at the top of the website. Lastly, the “Recent News” section will have an option to view all news at the bottom.

The last thing we recommend to change on the homepage is the Disclaimer section. We recommend integrating the Contributions section into the Disclaimer section to help make the homepage look less cluttered and more organized. The disclaimer could mention that the website is non-profit and could use your donation. This information and the links to donate could be included in the bottom of the Disclaimer section. The rest of the information currently on the homepage such as the Online Support Groups section, Awards / Accomplishments section, and other scattered information, should be removed from the homepage leaving the sections and information talked about above. This will leave a streamlined and well organized homepage that contains vital information about the website and what it offers.

4.2 Responsive Website Design

Responsive website design is a relatively new concept, which is used for more popular websites that also receive a lot of mobile traffic. Though this is geared toward the ability to view websites properly on mobile browsers, the implementation of this style could be
useful, especially regarding the home page, on VirtualTrials.com. Before changes, the link titles are quite long some of which extend far into the white space on the right of the home page. This could be eliminated by using the responsive web design method, and the links that would normally extend past the browsers window size would then collapse and be brought onto two lines instead for complete visibility of each link in any size window.

5.0 Conclusion

VirtualTrials.com provides users with the necessary information to research on the latest trials. However, the interface for the website was not designed for users to easily navigate and find what they are looking for. To be able to understand what the users want and the behavior of how users navigate in a website, the usability analysis and task analysis provided a perfect platform for our team to recommend changes on the website.

Usability analysis in its many forms has given us the opportunity to properly analyze and effectively provide educated recommendations to improve usability and overall quality of the websites functionality. VirtualTrials.com was an appropriate candidate that was determined to be capable of highly benefitting from a formal analysis and the proposition of solutions to common problems and inconveniences that can be avoided.

The task analysis provided us with the data on how long it takes for a user to achieve a goal. From the analysis, we can make recommendations on how to better design the interface of the website to minimize the time needed to achieve the same goal. The
insights from the task analysis can also be applied to the overall appearance of the website to produce a better user experience.

After the implementation of our recommendations, based on our analyses key elements of the website can be accessed more than 3 seconds faster (which in terms of surfing the internet is a lot these days!) while also using fewer mental operators. Providing the same information with less thinking involved is an attractive quality for any website, and can help put VirtualTrials.com on par with some of the leading websites in its field.
6.0 Reference

