The Effects of Interface Design on the University of Iowa Computer Science Website

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Abstract

Interfaces can make a tremendous impact on how the user works with a machine and how they are able to get work done. A group of Penn State students have examined the University of Iowa’s Computer Science Department website’s interface. Through testing users and performing task analysis we have found that some changes that may help the users of the website (most likely students and faculty at the University of Iowa) find what they are looking for on the website. With the suggested changes we hope to find that interface becomes more user friendly and really allows the website to provide users with the information they were looking for in a timely manner.
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1. Introduction: The need for well designed interfaces

In studying the users to a website, it is important to remember why studying the users or potential users is so important. There are three main reasons in order to study the user and these are: safer systems, better products and cost savings (Ritter 2011).

The idea of safer system does not apply much to the interface of a website, but mostly to medical tools and even airplane controlling devices. In a way, a website interface for students and faculty at a university can be more made “safer” by not allowing users to make errors and helping them easily correct their errors after they have been made. This can just mean laying out the page and menus better in order to help the users find what they are looking for more easily. Making a “safer” webpage could also include protecting against phishing attacks and viruses, but that is outside the scope of human-computer interaction.

Another benefit of studying the user is making better products. This can mean using the best technology available in order to make the system more usable and help the users learn how to work with it more quickly as well as making it the most efficient. Users will not always know what they want, so it is up to the designers to study the users and what they say in order to get a better idea of how to design the system. If the user does not want to wait more than two seconds for a page to load, then it is important to make sure that the page is being delivered to the user as quickly as possible, this may mean limiting the number of images on a webpage. Although some users may like plenty of graphics, so it is important to know what the user wants from the website.

Finally, knowing the user can save money. The main idea is to study the users as early
as possible to know what they want in a system. After the system is built, it will cost more
money to go back and make changes in order to make sure the user has a system they can
work with correctly. In order to reduce scope creep and changing the product substantially at
the end of production, it is important to study who the users are and what they will use the
system to accomplish. Knowing these ideas and performing user testing early, the system will
be cheaper to produce and a better overall product.

With these ideas in mind of why studying the user is so important we will go on the
mention some of the studies we performed on the University of Iowa Computer Science
Department website in order to improve the usability.

2. Evaluation of the webpage

The goal of the project was to improve the usability and the design of the University of Iowa
Computer Science department website. We looked at specific aspects of the website in order to find
where users could potentially save time, making the users more efficient in searching the site and
reading the information needed in order to accomplish their tasks.

2.1 Text readability and user performance

The definition or description of what makes a good web page is something that will vary from
user to user. We believe that the time it takes to user to read the information and how much the user
"likes" the web page are two important factors. We assumed that most visitors to the University of
Iowa Computer Science Department website are students and staff. There are other factors which may
be useful to change, however we chose to only study how the font size effects the time it took a user to
read a paragraph. We also asked the users to decide what type of font style they "liked" the most.
2.2 Task Analysis

Task analysis was performed on the website when asking the users to find the program coordinator’s email as well as a scholarship offered to under-represented minorities. Through the use of KLM and GOMS methods we were able to break down the steps needed to complete these tasks and predict how long it will take the users to complete the given tasks. We were then able to time the users and see how the predicted times differed from the actual times needed to complete the tasks.

2.3 The study

2.3.1 Participants

The participants were all students at the Pennsylvania State University. These students were undergraduate students within the College of Information Sciences and Technology. The participants were selected from within a given class. The given participants are assumed to be similar the students that would the University of Iowa Computer Science Department website since they are students with a technical background and working toward a similar degree. We are aware that all users are different and our results may vary when testing the actual users of the website, but we used a convenience pool for our participants assuming their similarities to the actual users of the website.

2.3.2 Material and equipment

For both of the studies involved with the website, the only materials needed were a computer with an Internet connection and a stop watch as well as users to study.

2.3.3.1 Procedure text readability

First we saved the source code files of the home web page for the website of interest (The University of Iowa Computer Science Department). We then made changes to the website. These changes were contained in the top section that includes news stories. We changed the
font to size 3, and made the font style Verdana. The original type of font was smaller and in FF Balance type of font. After this set-up we were able to start talking to the participants.

We had each participant first answer which type of font they liked better, showing them the original web page and the one with the changes. We recorded their responses. After this, we allowed each participant to read the changed paragraph on the site aloud. We timed each participant on a cell phone stop watch with two decimals of precision. We assumed that the new font would be faster to read. In order to help with our theory, we had each participant read our updated font first and then read the original. We know that due to learning the participants will be able to read the paragraph faster the second time with everything else constant (Hanley 2010). Due to this, we had the users read the assumed more readable text first, so that we knew if they read the first paragraph faster, that it was due to the change in the font and not due to learning.

2.3.3.2 Procedure Task Analysis

We gave users the tasks to navigate from the Computer Science homepage to locate the Honors Program Coordinator’s name and email address. The second task was to locate, also from the computer science homepage, what kind of scholarship that an under-represented minority could receive. The timer started when they began to search for where to go for both tasks. We assume that the first of these two tasks is one that a student of the University of Iowa might do about once a month. While sending email is usually a daily task, we figure that coming to this website to find a specific email address, will probably only happen about once a month for a given user. Searching for scholarships is a different kind of task that may not happen as often, but this will mostly be searched by undergraduate and graduate students.
This will probably be searched about once or twice a semester for each user. These assumed frequencies of the task help us to understand how important being able to find this information quickly is to the user of the website. We then compared the times needed to complete these tasks to the estimated amount of time needed to perform the task by using the KLM and GOMS task analysis models.

2.4 Analysis and Results

2.4.1 Results Text readability

From the readability study we found that the changes in the style of the text really helped the users read faster as well as the preferred the style. Below Figure 1 shows the font originally on the site and Figure 2 shows the updated font that we changed. Following those, Figure 3 shows the times to read the paragraph for each participant.
Figure 1: The original section of the website users were asked to read.

Figure 2: Updated section users were asked to read. The font is larger and a different style.
From the data, we can see that from the trial of five different readers on the Iowa Computer Science Departments website that the second styling of font and font size definitely made a difference in the reading time of the users in the trials. The first (the light) bars represent Iowa States' current Computer Science Departments font and font sizing options, and the second (darker) bar shows the second type of font and sizing, which we picked as a “better” alternative to the first font option.

We can see from the graphs that the second trial was visibly shorter than the first. Giving us conformation that the new font we chose was a better option for people reading the website. In the trials, we found that the first font and sizing options did not accommodate for the best reading. Some words were cut off onto new lines, and other sloppy things of that nature which cause a longer read time. With our second font we chose a more readable and
larger size to make it easier to distinguish between different letters and things of that nature.

We can see that for the original web page it took about 21 seconds on average to complete the reading. In the second trial with our improved font it took on average 16 seconds, giving us a very noticeable difference for about 23% for between their font choice, and our “improved” font and sizing, even though the participants already knew what the paragraph read.

2.4.2 Results Task analysis

Our task analysis also provided us with useful data. Using KLM we were able to predict how much time the users needed to complete each task. Below are the predictions for each task using the KLM model.

Task 1:  
The task required the user (assuming on the Computer Science web page) to:

1. (H) Move hand to mouse.
2. (P) Point at research.
3. (K) Click on research.
4. (P) Point at Contact Us.
5. (K) Click on Contact Us.
6. (P) Find name.
7. (K) Click on name.

This can be calculated as:
H+P+K+P+K+P+K+P+K

= 4K + 3P + H

= 3(.1s) + 3(1.1s) + .4s

= .3s + 3.3s + .4s

= 4s

Task 2:
The task required the user (assuming on the Computer Science web page) to:

1. (H) Move hand to mouse
2. (P) Point at resources
3. (K) Click resources
4. (P) Point at scholarship
5. (K) Click scholarship
6. (P) Scroll
7. (P) Find description that includes women or minority
8. (P) Find the scholarship name that has the description.

This can be calculated as:

H+P+K+P+K+P+P+P

= 1H+2K+5P
\[
= .4s + 2(.8s) + 5(1.1s)
\]
\[
= .4s + 1.6s + 5.5s
\]
\[
= 7.5s
\]

Using GOMS method we were able to discover different ways the user can find the same information. This gives us multiple paths and ways of completing the task to analyze.

Task 1:
Goal: Find the e-mail address for the Honors programs coordinator

Selection: Decide what method to use (search for honors, or contact information)

Method 1: Find a contact link

Step. Scan site for contact information

Step. Move to people tab, click

Step. Move to contact us, click

Step. Scan to words “Honors Coordinator”

Step. Move to name, Cesare Tinelli, click

Method 2: Find an honors link

Step. Scan site for honors information

Step. Move to undergraduate programs tab, click

Step. Move to honors link

Step. Scan paragraph to find words “Honors Program Coordinator”

Step. Move to name, Cesare Tinelli, click
Task 2:

Goal: Find scholarship available for under-represented minorities

Selection: Decide what method to use (visually search site or use search bar)

Method 1: Visually search site

- Step. Scan site for research areas
- Step. Move to resources tab, click
- Step. Move to scholarship tab, click
- Step. Scan for words “under-represented”
- Step. Scan for the name of the scholarship with that description

Method 2: Use search bar

- Step. Type “scholarships” into search bar, click search
- Step. Move to resources output from the query, click
- Step. Move to scholarship tab, click
- Step. Scan for words “under-represented”
- Step. Scan for the name of the scholarship with that description

We got our data by starting off at the University of Iowa Computer Science department’s website. In order to get the amount of time it took to locate the needed information, we used a cell phone stopwatch which records times down to a tenth of a second. The timer was started when the subject began to search. Once the correct information was found, the timer was stopped. The subjects we tested were undergraduate students in IST at Penn State. The data that we got while testing is soon in Table 1.
**Table 1. Results from task analysis**

<table>
<thead>
<tr>
<th></th>
<th>Task 1</th>
<th>Task 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 1</td>
<td>36.7s</td>
<td>84.5s</td>
</tr>
<tr>
<td>Subject 2</td>
<td>55.9s</td>
<td>52.2s</td>
</tr>
<tr>
<td>Subject 3</td>
<td>52.4s</td>
<td>62.5s</td>
</tr>
<tr>
<td>Subject 4</td>
<td>39.3s</td>
<td>50.3s</td>
</tr>
<tr>
<td>Subject 5</td>
<td>63.9s</td>
<td>35.3s</td>
</tr>
</tbody>
</table>

Average 49.6s 56.9s

*The subject was able to locate this so quickly because the user found this information while doing the previous task.

Looking at the KLM predictions it can be seen that the tasks take much longer than they should have to complete. KLM predicted times of 4 and 7.5 seconds for tasks 1 and 2 respectively. We can see from our results that on average task 1 took the user 49.6 seconds to complete, and this is more than 10 times the prediction! Task 2 took on average 56.9 seconds to complete, more than 7 times the prediction.

From our results and our prediction on how long the tasks should take it can be seen that none of the times were even close to the times predicted. Many times, a lot of cognitive activity needs to happen in order for the user to decide what to click and understand what they
are searching for. The problem in completing our task efficiently may stem from the fact that the names of the tabs did not provide the user with the correct idea of what kind of information was contained within them. This proves that the information scent might be flawed within the website. An email address should be relatively easy to find within a website. Clicking the "people" tab was not the only step needed to be done in order to find an email address, which is rather concerning. Also, we found that we should not test the same user on both tasks, because the one user was able to complete task 2 quickly because she had accidentally found this information when trying to complete task 1. Using separate users for both tasks will help to eliminate this error as well as recording the time for each subtask the user was completing.

3. Conclusions

Using the studies that we have performed we can make suggestions on how to improve the usability of the University of Iowa Computer Science Department website.

The font and readability study showed that perhaps the font should be changed on the homepage of the website. We were able to increase the readability of the text on the webpage as well as how much the user liked the website. From this we can see that changing the font size and style not only makes it easier for the user to read, but also is more enjoyable to the user as well. There are ways to improve upon these test by trying more font styles and different colors as well. Other tests can also be done to see what the users thought was the main idea of the paragraph while highlighting certain aspect. The results from this test give us better idea of how to improve the readability and gives us an idea of what other tests can be done to improve the readability of the font within the website.
The task analysis specifically looking at the GOMS and KLM models we were able to see that it is important to give users the right information scent when searching for information on the webpage. Many users found it confusing that the “people” tab on the website did not contain the same information as the “contact us” tab. The naming scheme of the information within the website can help users stay on the right information scent to better find the information needed. We also learned that it best to provide the users with multiple options to get the same information because not all of our users had the same ideas on how to complete the tasks.

The general suggestions above and the analysis of the website can hopefully provide a better understanding of the usability with the website and some suggestions on how to improve the webpage.

**Acknowledgments**

We need to acknowledge the help of the participants in our studies. Although we have asked for their permission to perform the testing and we have made the results anonymous, we appreciate that they were willing to perform the tasks. The results have provided us with useful data and a better idea of how enhance the user interface.
4. References

