The Pennsylvania State University
College of Information Sciences and Technology

Website Interface / Task Analysis

Group 5

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Abstract

As part of an overarching project for Dr. Ritter’s Fall 07 IST 331 class, we as a group were tasked to find a website or some other electronic interface with which to perform a usability analysis. Through a friend of one of our group members, we were told that the website for the Penn State chapter of Gamma Phi Beta would be an ideal candidate for such a study.

We started by performing a small task analysis, picking two things that the average user might look for on this website. We then ran a small pool of subjects through each task, and documents their actions and times to be used in both a KLM and GOMS analysis. We ourselves then went over most of the site looking for areas where visual perception effects (such as the popup effect) were either already in place, or could be put in place to enhance clarity and usability.

Both of the analyses run on the Gamma Phi Beta website indicated that their average usability was well within the standards defined by the KLM and GOMS models. We could then draw from these results the conclusion that the website could stand to add significantly more content and functionality without becoming unusable. We plan to pass these suggestions (along with this report) to the Webmaster and the sorority to allow them to take further action.
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Introduction

Creation of the Site

Gamma Phi Beta is a college sorority with chapters at several universities across the country. The website we chose to analyze is that of the Alpha Upsilon Chapter, here at Penn State. While the sorority has been active in the U.S. since 1874, the Alpha Upsilon chapter at Penn State is fairly new, with their website being brought up just last year, in 2006.

Figure 1: Screenshot of the Alpha Upsilon Home Page
The Webmaster
Andrew Connor is the individual primarily responsible for the design and maintenance of the Alpha Upsilon website. He is a good friend of one of our group members, and thus a close contact for our project. He has agreed that anything we find and/or recommend will be taken into careful consideration towards making changes to the sorority’s website.

 Reasons for our Analysis
We chose the Alpha Upsilon website for a number of reasons, listed below in order of relative importance:

1. **Relatively New** – The website for Alpha Upsilon we developed and posted fairly recently, and has not gone through very many refining processes, making it an ideal candidate for a usability analysis.

2. **Close Contact** – With one of our group members being good friends with the webmaster, we were able to get information back and forth easily.

3. **Available Material** – We as a group have already done a small-scale version of a Task Analysis, using this website as the subject. We can simply expand on our original work and incorporate it into our decisions and recommendations.

We immediately noticed some things that could be changed with the website, which are illustrated in Figure 2.

![Figure 2: Some areas that could use noticeable improvement.](image-url)
We were also able to find a professional-level online resource for designing websites, a “Website Usability Checklist” created by Keynote NetMechanic. Provided below are just a few of the points he recommends, which we took into consideration when designing our analyses (pardon the numbering, not all of his points applied to the sorority’s website):

1. **Design a clear and simple navigation system.** According to Web usability expert, Jakob Nielsen, a good navigation system should answer three questions:
   1. Where am I?
   2. Where have I been?
   3. Where can I go?

2. **Keep the content clear and simple.** You may attract visitors with an eye-catching design, but content is what keeps them at the site and encourages them to return. Content is also the best way to boost your site in search engine rankings.

   Always keep search engines in mind when you write content, but remember that your ultimate audience is human visitors. Present your content with humans in mind.

4. **Provide for visitor feedback.** Forms are critical to the success of ecommerce sites. Without forms, you can't have a shopping cart. But any site usually needs at least one form to allow for user feedback. A form helps you hide from email spiders and also helps you control how user feedback is formatted and sent.

5. **Test the site on real users.** Remember that you're the designer so of course you effortlessly use the navigation system, love the content, and understand the value proposition. But now it's time to get user feedback - before your online users start sending it in.

   (NetMechanic, 2004)
Analysis

Task Analysis

Introduction
According to Ritter, a “task analysis is a technique for representing what people do when they perform a task.” To better understand the Penn State Gamma Phi Beta sorority website, we performed two tasks using the keystroke level model and GOMS. We performed these two tasks on five subjects. The first task performed was e-mailing the sorority president. The second task performed was browsing pictures from Penn State’s THON dance marathon.

We used these analyses to help us do various things. One goal of these analyses was to help us describe and understand the behavior of the user when using the Gamma Phi Beta website. By creating a task description, we’re able to understand exactly what the user is doing to complete a task. Another goal we wanted to accomplish was to be able to make predictions of the user’s behavior against an absolute scale. This allows us to make a time prediction for how long it will take to do a task and then perform an analysis to see if the design of the website meets this predicted time.

Methodology
To create our task analysis, we used both the Keystroke-Level Model and GOMS Analysis. Below are the methods to create the task analysis for each type of model. **KEystroke-LEVEL Model TO Estimate Execution Times (KLM):**
The following is a step-by-step description of how to apply the KLM to estimate the execution time required by a specified interface design:

1. Choose one or more representative task scenarios.
2. Have the design specified to the point that keystroke-level actions can be listed for the specific task scenarios.
3. For each task scenario, figure out the best way to do the task, or the way that you assume users will do it.
4. List the keystroke-level actions and the corresponding physical operators involved in doing the task.
5. If necessary, include operators for when the user must wait for the system to respond.
6. Insert mental operators for when user has to stop and think.
7. Look up the standard execution time to each operator.
8. Add up the execution times for the operators.
9. The total of the operator times is the estimated time to complete the task.

**GOMS Analysis**

The form for a method is as follows:

- Method for goal: `<goal description>`
- Step 1. `<operator>` ...
- Step 2. `<operator>` ...
- ...
- Step n. Return with goal accomplished.

In order to relate the task analysis to our overarching final project, we applied these two models of analysis to the Penn State Gamma Phi Beta sorority website. These models were applied to two different task analyses. The first task analysis performed was e-mailing the sorority president. The second task analysis performed was browsing pictures from Penn State’s THON dance marathon on the sorority website. The following section contains the results obtained from both task analyses.

**Analysis**

**Task 1 – E-mailing the Sorority President**

**GOMS Analysis:**

Method for Goal: Contact Sorority President.

Step 1: Locate Information

Selection Rule:

- If information is on the page, return with goal accomplished
- If not,
  - Accomplish goal: Locate Link

Step 2: Compare information with that of working memory

Step 3: Navigate to Exec Board page

Step 4: Accomplish goal: Locate (e-mail) link

Step 5: Fill out and send e-mail

Step 6: Return with goal accomplished

Method for goal: Locate Link.

Step 1: Compare Information on page with working memory.

Step 2: Move to Link

Step 3: Click Link

Step 4: Return with goal accomplished.

**KLM Analysis:**

Starting at the home page.

Locate Link for Exec Board – M

Point to the Link – H P
Click The Link – K
Locate Section for Sorority President – M
Locate Name for Email – M
Point to e-mail link – H P
Click Link – K

E-mail opens and user completes and sends.

M = Mental Operator = 1.35s
H = Homing the hands = 0.40s
P = Pointing with some device = 1.10s
K = Keystroke/button press (assuming average typist) = 0.20s

$$3*1.35 + 2*0.40 + 2*1.10 + 2*0.20 = 4.05 + 0.80 + 2.20 + 0.40$$

= 7.45 seconds, KLM Predicted time

**Task 1 Series**
Subject 1 - 6.79s
Subject 2 - 3.625s
Subject 3 - 4.623s
Subject 4 – 3.585s
Subject 5 – 4.125s

**Task 2 – Browsing pictures from Penn State’s THON dance marathon**

**GOMS Analysis:**
Method for Goal: Locate and view THON pictures.
Step 1: Compare information with that of working memory
Step 2: Locate Information
Step 3: Click Link
Step 4: Compare new information with working memory
Step 5: Locate Information
Step 6: Click Link
Step 7: Goal Complete: View pictures

**KLM Analysis:**
*Starting at Home Page*
Locate link to find pictures M – 1.35 sec
Move hand to mouse H – 0.4 sec
Point cursor to Pictures link P – 1.1 sec
Click Pictures link B – 0.1 sec
Release pictures link B – 0.1 sec
Find link to Thon M – 1.2 sec
Point mouse to link P – 1.1 sec
Click link B – 0.1 sec  
Release button B – 0.1 sec  

M = Mental Operator = 1.35s  
H = Homing the hands = 0.40s  
P = Pointing with some device = 1.10s  
B = Button press = 0.10s  

KLM Predicted time = M*2 + H + P*2 + B*4 = 5.4 sec

**Task 2 Series**
- Subject 1 - 4.56s  
- Subject 2 - 3.28s  
- Subject 3 - 4.39s  
- Subject 4 - 4.46s  
- Subject 5 – 3.86s  

**Discussion**

**GOMS Analysis**
When performing the GOMS analysis on both tasks, we were looking to be able to describe and understand the user’s behavior when performing those tasks. By breaking down each task into its components, we are able to get a better understanding of what the user is thinking throughout the task. The GOMS analysis only describes expert, error-free performance. However, expert, error-free performance doesn’t exist. The validity of the GOMS analysis has thus been questioned. Despite this questioning, we used the GOMS analysis to help us clearly see which steps were needed to complete the task.

When we broke down each task into the components, we were able to see that neither of the tasks was too lengthy to accomplish. They were all simple and none of them had hard mental operations. Hard mental operations make the task difficult to complete. The results of the GOMS analysis helped us to create and analyze the two tasks using the KLM analysis as well.

**KLM Analysis**
The KLM analysis (keystroke level model) is a “simplified version” of the GOMS analysis designed by Card, Moran, and Newell. This analysis according to Ritter is “a fast and approximate way to compute how long users will take to perform a task. When the operations to perform a task are analyzed down to their elemental perceptual, motor, and cognitive actions, then by adding together the times for these actions it can be possible to make time predictions for expert, error-free performance.” By performing this analysis, we were able to accomplish our goal of being able to make predictions of the user’s behavior against an absolute scale.

When performing the KLM analysis on task 1 (e-mailing the sorority president), we had a predicted time of 7.45 seconds. When having our subjects perform the task to see if the
predicted time was met, we found that all five subjects had results that were beneath the predicted time. The highest time to complete the task was subject 1’s time of 6.79 seconds. The lowest time was of subject 4’s with 3.585 seconds.

When performing the KLM analysis on task 2 (browsing pictures from Penn State’s THON dance marathon), we had a predicted time of 5.4 seconds. Similarly to the first task, all subjects that performed task 2 had results beneath the predicted time. The highest time to complete the task was subject 1’s time of 4.56 seconds. The lowest time was of subject 2’s with 3.28 seconds.

**OVERALL DISCUSSION**

Relating this to our overarching final project, these results provide us with insight that this type of navigation on the website is currently sufficiently designed to accommodate user friendly navigation. In terms of performing basic tasks on the website, we feel the webmaster designed a satisfactory website that can allow for these simple tasks to be completed without taking a long time. These task analyses do not offer information for formative evaluations and thus can’t be used to determine whether the interface of the website is acceptable or unacceptable. The KLM analysis assumes a concentration on one task at a time with a fully specified interface with no interruptions. This type of analysis describes the two tasks we performed which made it in effective analysis for us to decide within the limitations of these analyses, that the website was designed satisfactory.

**WebXACT Analysis**

**Introduction**

Watchfire provides a utility known as WebXACT that analyzes the Accessibility, Quality, and Privacy of any web page. Focusing on the Accessibility analysis, several factors that are relevant to this course are explored using the utility. A list of information needs of users are often used by website designers to “find out if their systems supported all the anticipated information needs of their users, and to update their sites accordingly.” (Ritter) The WebXACT utility directly supports this claim, and is used to aid in our analysis and usability overview of the Gamma Phi Beta website. For this instance, we focused on 6 guidelines provided by Watchfire that showed relevance to both the course content, and the analyzed website.

**Reasons behind each Guideline Used**

**Provide alternative text for all images**

All images posted on a website should include a short alternative text description, used to represent the image. A good test to determine an appropriate alternative text description for an image is as follows:
Act as if you were calling a friend, and needed to explain the entire webpage through speech only. Think of what you would say to make this webpage image comprehensible to your friend, and then use this description as your alternative text.

The reason behind using alternative text is simple, computers cannot interpret an image, and rather they rely on the alternative text in order to present useful information to the user. This is especially important for users who turn off image loading, use text based browsers, or those who are visually impaired and use screen reader software to aid them in understanding the web page. (WebXACT)

Provide extended descriptions for images that convey important information
For such images as a table, chart, or diagram, an additional description of the images content may be warranted. This information could be portrayed on the same page, or a separately linked page from the image. Once again, computers cannot interpret these images without alternative text, and those who are visually impaired may rely on reader software which will require this additional information to correctly explain tables, charts, or diagrams. (WebXACT)

Foreground and Background colors contrast sufficiently
People with color or contrast perception problems will have difficulty viewing pages that do not have sufficient contrast between colors. Also, those with monochromatic displays may have problems viewing the page. In order to test whether or not color contrast is sufficient, try printing the page in grayscale, then copy and print this result 2-3 times to see how the image degrades. This will give you hints as to where color contrast needs improvement. (WebXACT)

If color is used to convey information, alternatively represent the information
Those who cannot differentiate between certain colors, or those who have monochromatic displays, will have difficulty understanding the information being conveyed to them. Avoid such terms as “Select an item from those listed in red”, and instead use other effects such as different shapes or style effects. (WebXACT)

Separate adjacent links with more than white space
Users who are visually impaired may have trouble viewing which text are links, and which are not. To a normal user, hyperlinks are usually blue and underlined. To someone who is visually impaired, this may appear as normal text that is underlined, reducing the distinction of and between hyperlinks. To counter the issue of readers mistaking adjacent links as a single link, place images or explicit separator characters such as “[ ]” or “|” between each successive hyperlink. (WebXACT)

Elements are operable without a mouse
For those who are using the page without sight, with voice input, or with a keyboard may have problems if they need to use a mouse to perform some type of interaction. It should be assumed, while designing a website that the user will need to use these alternative forms of input. Some tips include:
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- Actions such as moving over an object and clicking it should also be able to work by some type of keyboard action, such as using the tab key to navigate links, and using Enter to act as the mouse click.

WebXACT Results

### Home Page – Figure 3

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<tr>
<td>Separate adjacent links with more than whitespace</td>
<td>7</td>
<td>57-63</td>
</tr>
<tr>
<td>Does not provide alternative text for all images</td>
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</tr>
<tr>
<td>Elements are not operable without a mouse</td>
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### Executive Board Page – Figure 4

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<td>Foreground and background colors do not contrast sufficiently</td>
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<td>Separate adjacent links with more than whitespace</td>
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### Sisters Page – Figure 5

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<td>Elements are not operable without a mouse</td>
<td>0</td>
<td>-</td>
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</tbody>
</table>
Analysis Regarding WebXACT Results

Analyzing our results from the tables above, we were able to draw some general conclusions regarding the overall design of the website. First of all, every page had some type of issue that needs to be addressed to allow for full usability, although some require more work than others. The Sister’s Page, in regards to our results, was the best designed out of all 7 that were analyzed. The worst designed page was the Pictures Page, which contained 48 design errors. The rest of the pages averaged around the same amount of errors.

The “Color used to convey information”, “Image conveys information beyond what is in its alternative text”, “Foreground and background colors do not contrast sufficiently”, and “Does not provide alternative text for all images” sections were all directly related to each other. In these cases, all errors were related to the same image on the web page. This shows to us that the designer should focus highly on making all images acceptable for users with disabilities such as speech or vision, or monochromatic screens.

Overall, there were also a few instances where the page would be insufficient for users to navigate without the use of a mouse. This should be addressed in order for users that utilize voice recognition, or only use a keyboard, to have the ability to navigate the site appropriately.
Visual Perception Analysis

Introduction

As with any type of visual interface (such as a website, software program, etc.), the way in which the user views the interface, and how the interface interacts with the users’ eyes is important to usability. An impossibly small title amongst ridiculously large text can lead to confusion and poor readability. Also, links and pictures that are heavily embedded in with the bulk of the site can cause them to be overlooked or lost. This is why Visual Perception is so important.

Basic Analysis

Unfortunately, the Visual Perception labs we performed in class were controlled and simplified environments to make timing easy. Instead of following this setup, we went over the site and found some relatively straightforward examples of areas where visual perception is effective, or could use improvement. A few are provided below:

Figure 10: Good use of Popout Effect.
Examples

Figure 10: This is one of the more obvious examples of good Popout Effect. The Popout Effect is created when titles and subtitles, or links and pictures, or any form of media for that matter, are sized and centered in a ranked order of importance. This way, the user or reader can more easily identify the more important information and digest it more easily.

Figure 11: This is an example of where Visual Perception analysis could be used to a marked improvement. It is very hard to tell, even after looking at this page for some time, that “Recommendation Form” is in fact a link to their Recommendation Form on a separate page, and not simply a section header.

Discussion

The website uses contrasting colors to help users focus on the important information within a page. This is done by having major titles in a pink color, and body text in black. This helps to draw a user’s attention to the title, and allows them to browse a page and see the highlighted titles and headlines. The popout effect is successfully used on this website; however, they could certainly improve on the readability in some areas. Currently, major titles are a larger size, while secondary headings only differ in color. If
the secondary headings were also underlined, bolded, or italicized, or had differing font or font size, the headings would be differentiated from the body text more effectively.

**Conclusions**

Based on the results from the in-depth Task Analysis and WebXACT Analysis, along with our cursory overview of the general visual perception of the site, we came to several conclusions that seemed to mesh together:

**Task Analysis:** We first ran a GOMS analysis to determine the relative “action path” that a user might have to take to perform the selected tasks. What we found is that the GOMS paths for both tasks were deemed to be relatively simple and straightforward, without a lot of selection rules and backtracking, both of which could cause confusion in users.

After completing the GOMS walkthrough, we recruited several test subjects to run through the same tasks for a KLM (Keystroke-Level Model) analysis. This time, instead of watching their selections and focusing on possible crossroads, we simply timed their actions and recorded exactly what they did. The main goal of the KLM model is to determine if the functional parts of an interface are laid out in such a way that it is easy for the user to navigate them and perform certain actions. Both tasks, as performed by both users, had total completion times that were well below the KLM standard times for an “effective interface.”

Using both of these results, we came to the conclusion that performing basic tasks on the website, such as e-mailing members or finding THON pictures, could be done quickly and efficiently.

**Task Analysis: PASS**

**WebXACT Analysis:** WebXACT was able to delve into several example pages we provided it from the sorority website, and came up with even more detailed results than we could have hoped. While the majority of the pages we provided it were functional and looked in good shape from the surface, there are several things that WebXACT found that needed improvement.

Aside from the odd link error or text error, the most notable result we achieved from WebXACT was the complete lack of compatibility for users with disabilities. By not using a variety of colors, or providing alternative text for images, the Alpha Upsilon site becomes very hard to read for people with some form of colorblindness, or who are completely blind and rely on page-readers.
So, while the functional aspects of the website are fairly secure, it could stand to see some significant improvement in accessibility for persons with disabilities.

**WebXACT Analysis: NEEDS IMPROVEMENT**

**Visual Perception Overview:** While we were not able to directly perform a visual perception or popout experiment using the sorority website, we were able to take what we learned and apply it to a cursory overview of the pages.

What we found was that, while several pages made good use of the popout effect in making larger, more noticeable titles, other pages had problems with visual perception. In the one case presented above, a relatively important link was too small and almost hidden in with body text and/or confused for a section header.

**Visual Perception Overview: NEEDS IMPROVEMENT**

**Recommendations**

Based on the results of the three analyses performed in this study, we as a group decided on two focused recommendations that would see marked improvement in the quality of Alpha Upsilon’s website:

**Recommendation 1: Add Content** – This recommendation comes primarily from the Task Analysis. What we found when performing both the GOMS and KLM analyses was that the site was fairly simple and did not challenge the user to find content. We believe that, because both analyses came out well under the “usable” mark, Alpha Upsilon can safely add additional material and resources to their website without negatively impacting the user.

**Recommendation 2: Take More Considerations** – This applies not only to any new content the sisters might add, but to all the content on the website. By neglecting to make the website accessible to those with disabilities, the design is preventing access to a large (and growing) population of individuals who are either colorblind or completely blind who might try and access the pages through a page-reader.

We believe that by following these two general recommendations in reformatting their website, Alpha Upsilon can see a noticeable increase in user traffic and user satisfaction, while still being able to provide additional content.

*We would like to thank Alpha Upsilon, Gamma Phi Beta, and Andrew Connor for giving us permission to do this study, and we hope that what we have found will be of use to them.*
References


Other Sources
(Reviewed but not specifically cited.)
