Terrapin Trader Transformation

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Abstract

The Terrapin Trader Transformation project was started to develop an online, dynamic database for Terrapin Trader, an existing surplus store for the University of Maryland, College Park. The design was created after examining other surplus sites, and with much consideration for principles of human computer interaction. Its functionality includes submission of surplus, searching for surplus, and management functions for administrative accounts. Usability tests were conducted on a prototype of the design and modifications were made based on user feedback. The priority of the project was to create an interface that is easy to navigate and understand rather than implement an expansive feature set. A list of features which should be added before a final release is included to help future designers. The group hopes that it will later be integrated with Terrapin Trader, but currently the site is a separate entity.

Credits

Oliver Stohr:
- Initial Prototype design.
- Programming head.
- Final PowerPoint presentation.

Olga Kuznetsova:
- Designed user test pre/post-test and user tasks.
- Conducted 4 usability tests with write ups.
- Development Process and Conclusion of final report.

Tyler Cordrey:
- Edited final documents.
- Contact with Terrapin Trader.
- Conducted 2 usability tests + write ups.

Brett Holbert:
- Introduction and Presentation of Design of final report
Introduction

The Terrapin Trader Transformation project began as an effort to promote sustainability through the reuse of furniture and other items that people commonly discard but which could be reused by another party. We discovered the Terrapin Trader website while researching related services within the University of Maryland. The site’s purpose is to collect and resell items no longer needed by University departments. It matched up well with project goals, and happened to be in much need of a redesign. The existing site breaks many of the principles of human computer interaction. To solve this problem, the focus of our project was adjusted to create a new user friendly interface for the Terrapin Trader. The hope is that this will lead to increased usage of the site and promote the reuse of all kinds of items at our school which would have otherwise been discarded. These edits to the site would also allow Terrapin Trader to be ‘greener’ as less paperwork would need to be filed when items are submitted.

Discussion of Previous Work:


To get an idea of how similar sites are designed, the surplus sites from other college campuses were analyzed. The surplus sites for Princeton University and Michigan State University were both examined and both positive and negative principles of human computer interaction were identified. One feature of both these two sites and the Terrapin Trader site is that surplus items are not submitted on the site but through forms that users must print out, fill out by hand, and then turn in to the surplus offices at the respective universities. The item listings must then be uploaded manually by one of the site administrators.

One difference between the three sites is the manner in which users may access the uploaded items. For the Terrapin Trader website, the item listings are placed directly on the site itself. However, they are also placed on auction sites such as ebay.com. The Michigan State site functions in exactly the same way, with their uploaded items available both on their site and on ebay.com. The Princeton surplus site also uses a third party bidding system. However, their system requires users to register specifically to access their items as opposed to a site like ebay.com which groups the Terrapin Trader’s items in with items uploaded by every other seller.
In order to allow the website to update the item database rather than having an administrator do it manually, the database must exist on the web server. Microsoft Access allows for the creation of such databases. Since some members of the Terrapin Trader Transformation project group have previous experience with Access, we initially looked into Access for our database, but ultimately the lack of a free windows server and the requirement for interoperability with the existing site drove us to look elsewhere for our database solution.


SQLite is a free lightweight database implementation which runs on a variety of platforms. It is easy to deploy and works well with PHP, and we ended up choosing it to manage our database. It is widely used and should be easy to integrate with the existing Terrapin Trader site.


PHP is a scripting language which allows for the creation of dynamic websites. The current Terrapin Trader website is a static website, but this does not allow the site to access the database that contains the items without a manual change of the website’s code. The Terrapin Trader Transformation site was created using PHP so that the site could properly interact with the item database.


The article “Linking Messages and Form Requests” deals with retrieving messages based on the entries in a form-fill-in system. This is important to the Terrapin Trader Transformation project as it enables the item search to be more user friendly and better suit the user’s needs.


The article “XIRQL: An XML Query Language based on Information Retrieval Concepts” describes a variant of XML known as XIRQL. This language is designed to incorporate rankings of different fields into database results returned through XML. This enables the results to be ranked more efficiently according to user needs.
Presentation of Design

Project Approach and Design Considerations

The Terrapin Trader Transformation project decided to approach the Terrapin Trader website with the idea of making the site more user friendly. Initially the administrators at Terrapin Trader were contacted so that their input on the project could be obtained, but unfortunately after the first couple of calls contact was lost. The current intention of the project is that contact can be reestablished and the official Terrapin Trader site can be adapted to incorporate features that have been added into Terrapin Trader Transformation.

A major part of making the site more user friendly was allowing users to submit forms for their surplus items directly on the site rather than having to print, fill out, and turn in the forms. The input from these online forms would then be processed by the web server and added to the items listings on the Terrapin Trader website once an administrator marked their approval. Currently, an administrator must manually alter the code of the web page to add a new item. It was decided that SQLite 3 would be used to handle this function of the site. This provides the technology to allow the item listings database to be updated automatically, a big improvement over the static database of the previous site. It is also freely available and easy to deploy in many environments. The Terrapin Trader Transformation site would be able to add items to, remove items from, and search the new database, allowing for much more convenient site setup for site administrators.

The other aspect that needed to be addressed was the compliance of the Terrapin Trader website with the Eight Golden Rules. The current site fails to comply with many of the rules. There are inconsistencies with the style of the different pages as well as some problems with page layout. To solve this problem, the Eight Golden Rules were taken into account when the Terrapin Trader Transformation site was being created. How these rules were applied is detailed later in this report.

Initial Prototype Designs

The initial prototypes for Terrapin Trader Transformation were designed with the idea in mind that most users of the site will fall into three categories. They will either be a user uploading surplus items, a user searching for surplus items that they can purchase, or an administrator wanting to access the list of items that are awaiting approval. As such, links to these three areas of the site are the focus of the home page and occupy the most area. To better catch the attention of users, the text in these links is of a larger size than the text on the rest of the page. Prototype A further emphasized the links by placing relevant icons beside each option.

The item submission pages for both prototypes request the main information required by Terrapin Trader. These are the place and time the item will be available for pickup and the description of the item. The agreement area contains the contract that users agree to when they submit the items. In the prototypes this area consists of a blank space, but if the designs were ever used, the text of Terrapin Trader’s contract would be there.
[Figure 1] Prototype A Home Page

[Figure 2] Prototype A Item Submission Page
Welcome to TTT!

>>> Submit your existing surplus to the TTT team for review.

>>> Manage approved surplus.

>>> Find and filter approved surplus in the TTT online database.

[Figure 3] Prototype B Home Page

[Figure 4] Prototype B Item Submission Page
Final Prototype Design

Once the two prototypes had been created, it was possible to compare the strength and weaknesses of each to prepare a final design. The color scheme and home page layout of Prototype A was deemed easier to read and faster for users to find the section they wanted. However, the top bar containing the links to the submit, management, and find pages in Prototype B allows users to navigate to whichever of the main pages they want without having to first return to the home page. Figure 5, the home page for the final prototype, demonstrates how the aspects of these two prototypes were combined into one design.

With the general page design completed, it was important to establish which pages would be needed for the site and how they would flow together. This page flow was detailed in transition diagram, Figure 6. This diagram visualizes how the three main functions of the Terrapin Trader Transformation site function. For the most part they are able to operate as separate entities, but some actions, namely the submitting of items and approval of new items, require interaction between two of the sections.

![Home Screen](image-url)

[Figure 5] Home Screen. This is the first page that users are directed to. From here they may log in or navigate to another page. Links to information about the site are in the bottom right corner.
Site Tutorial/Help

When users log on to the Terrapin Trader Transformation project, they will be directed to the home page, Figure 5. From this page they may access all of the areas of the site. In addition, they may log in or register as a new user. Should they log in, they will still be on the home page, but now their login info will be accessible.

By clicking the New User link in the log in area, users will be directed to the registration page, Figure 7. Most of the forms on this page are straightforward, but the e-mail address must be a umd.edu address. Users must also input the room at which items they post will be available for pickup.
After the user has logged in, they will be able to access the Submit Surplus and Find/Browse Surplus areas of the site. If their account is an administrator account, they will also have access to the Manage Surplus area.

On the Submit Surplus page, Figure 8, users must enter information about the items they wish to upload such as their age and serial numbers. Also required is a general description of the items and the category the items fall under. These are used when other users search for items through the Find/Browse Surplus area. Users must also enter the time at which the items will be available for pickup.

[Figure 8] Submission Page
In the Find/Browse Surplus area, Figure 9, users can search for their desired item by searching for words in the item description. These results can be further clarified if the user selects an item category or a range for the item’s price or age. Once the user has entered their search, the relevant results appear in the area below.
In the Manage Surplus area, Figure 10, administrators have access to items that users have submitted but which have not yet been approved to be added to the item listings. On this page, they may set the price as well as changing a variety of other information about the item. Once they have finished editing the information, they may approve the item and it will be added to the list of searchable items.

[Figure 10] Search/Browse Surplus Page
The other areas of the site unrelated to the item surplus functions are the About, FAQ, and Contact pages. The About page, Figure 11, contains information relating to Terrapin Trader as well as the Terrapin Trader Transformation project. On the FAQ page, users can find answers to any questions they might have about the function of any of the pages in the website. The Contact page, Figure 12, allows users to provide feedback about the site as well as to ask any questions they have that are not covered in the FAQ.
Report on Development Process

Preliminary Prototypes Development

Our goal in the preliminary design was to create a dynamic submission system to replace the static HTML system used by Terrapin Trader currently. We had originally thought to re-design the entire site, but then realized the project was too large for a semester-long study. The goal was switched to have a semi-automated system that would be able to accommodate the basic three tasks: submission of surplus, management of surplus by administrators, and searching through surplus.

We developed some user scenarios before starting the design in order to make sure that the tasks that users would need to perform would be available. A sample of the scenarios for each of the types of users A,B,C is given below. These scenarios, through we didn’t implement all of the tasks in the scenarios, and also utilized other situation, helped us come up with some of the ideas to help us implement the system. These scenarios were used to ensure that the design of the interface allowed for easy traversal between the tasks and that the directions given were clear.
USER TYPE A: The user who wants to submit surplus property to Terrapin Trader.

Jane Doe from the Computer Science Department has a surplus desk. Jane Doe is an experienced computer user. The desk is used but in good condition and Jane Doe has a picture of it available that she would like to post with the listing. They would like to submit the desk to Terrapin Trader and to have them pick up the desk. Jane Doe would like to have any payment for the desk credited to the FRS University account. This is Jane's first time using the website and Terrapin Trader. She will submit her listing to the Terrapin Trader website and await a response on whether her desk is accepted and when it can be picked up. She will then be notified when the item has been moved to the inventory and is now available for purchase for 25 dollars, as that is the price of similar desks listed. Finally she will be notified when the desk is purchased, and that she will not receive any compensation as the selling price was less than 50 dollars.

[Figure 13] User Type A: Submission

USER TYPE B: The user is an administrator at Terrapin Trader.

Bob Jones works at Terrapin Trader and has received a request for the listing of a desk on the website submission form. Bob views the times that the desk can be picked up and contacts the person who submitted the listing with potential times. The item is picked up. The desk is similar to some items already on display and is assigned the price of $25. Bob then changes the status of the item to on-sale and viewable on the website. He does not want to come back to change the status of the listing when it is available for purchase to non-University employees and then the public (after 1 week and then after 2 weeks). The next time he looks up the item is when the sale is made and he deletes the item from the website and sends an email to the person who had listed the item.

[Figure 14] User Type B: Administrator

USER TYPE C: The user is a potential buyer.

Zach Thomas, a university official, from the Computer Science department would like to buy a chair for his department. He finds several chairs that are available on the website that he likes from the description. He would like to find them easily when he arrives at the location as he is very busy. He arrives and finds the chair that he would like to purchase and completes the transaction.

[Figure 15] User Type C: Search

Based on these user types, an initial prototype design was created (Figure 1). Several such initial prototypes were examined before selecting this one as the main design. For example, Figure 3 is an example of a mock-up of a prototype that we decided not to pursue. This prototype was found to be too bright and cluttered, and the prototype selected seemed to be simpler and easier to navigate and manipulate in the future. This was just an image, and was used to work out how to approach the design before starting to write actual code.
After the design was settled on the actual coding of the website began. A backend structure was agreed upon as detailed in Figure 16, which would include all of the information that needs to be known about a user, and an item. The group found that it was important to agree upon the back-end of the design early on because that is more difficult to change once the project was underway.

![Figure 16] Planning the backend structure.

*Prototype Screenshots*

The screenshots of Terrapin Trader Transformation before the usability test are shown in figures 7-12. The main screens viewed by the user are outlined below. It was decided to proceed with an actual website implementation rather than a flash prototype because that would be easier to integrate with Terrapin Trader at a further date.

When a user arrives at the site, they will come with one of the following missions: to search for an item, to submit an item, or to manage the database. If the user is not sure of what to do, there is an About Us, a FAQ and a Contact form linked to in the lower left of the screen that would provide more information at all times. The Terms and Agreements section is included to protect the user as well as the operators of the site.

If the user wants to submit an item they will need to be logged in. If a user knows this already, they can login or create an account before proceeding. An account can only be created with a University of Maryland email address, facilitating security of the campus surplus feature for submission. The created account stores the information about the location of the user, which is where any submissions that they create will come from, their email for further contact, and a username and password for login. Administrative accounts are created by the webmaster for additional security. No account is necessary for searching/browsing for items since this can be done by anyone, and since items are not available for purchase online, no account needs to be created.

After a user is logged in they can navigate to submit surplus. The user needs to fill in a form detailing information about the item they want to submit including the tag number (as all items are university owned), condition, category, and desired pick-up time. Submission of an item will not automatically make it searchable, but place it in the queue of items pending approval from an administrator.
The management of surplus tab can only be accessed with an administrator account. An administrator is able to view all submitted items and approve/reject them from the database. They also set the price of the item before placing them in the database, as well as make any corrections. This is also where the administrator can view the desired pick-up time to get the item to the warehouse. An approved item is placed in the searchable database.

The search tab can be viewed by any user. A user can either search for keywords in the name of an item, or browse by category, price and age. Items that are found are displayed below. Their description, age, condition, price, category and posting date are shown. The posting date allows the searcher to known whether the item can be purchased by them as items are available for a week to only university employees, then to anyone associated in the university, and only then to the general public.

The site provides easy navigation as any of the tabs is always accessible as well as the homepage and information about the site. A user knows where they are in the process from the descriptions at the top of each page.

Compliance with Eight Golden Rules

Consistency
Our interface is very much uniform in appearance across its various screens, and its links and buttons behave as expected. The original Trader interface was rather inconsistent in its layout of controls and information; this was one of the major issues we sought to address.

Shortcuts
The persistent links at the top offer quick access to each user function. It can be difficult to implement keyboard shortcuts on a web interface, but the site could benefit from the addition of some well thought controls, especially for the administrative tasks. This is something that should be considered for inclusion in a final implementation.

Offer informative feedback
Our prototype keeps the user informed on the results of his or her inputs into the interface through dynamic updates upon every input. One thing a final implementation should include e-mail notice for submitted items, to provide an additional level of verification that the user’s submission was successful.

Dialogs yield closure
The requisite tasks here have a definitive start and end, and the corresponding parts of our interface provide closure upon completion of actions. The user will feel confident that he or she has successfully completed a task.

Error handling
Most possible user errors are handled gracefully, with messages informing the user of the problem(s). On the search page, the user will be informed of invalid search criteria by a message in the results section. The user is informed of invalid input in text fields when creating an account or submitting new items through specific messages at the top of the page.
Permit easy reversal of actions

To the extent that is reasonable, we attempt to allow for easy reversal of actions. While searching it is very easy to try another search, or browse in another category. But for instance once an item is submitted, it cannot currently be modified without contacting an administrator. Also there are some forms which prohibit the use of the back button, we require the user to navigate the site using the controls we provide.

Support internal locus of control

The nature of the requisite tasks is rather linear, so there is a rather set path of user action here. But the user is freely able to choose which task to complete in whatever order he or she pleases, and is able to navigate to different sections via the tabs on the top of the page.

Reduce short-term memory load

This is another area that was much improved over the original site. We designed our screens to be concise and straightforward, with relevant information displayed prominently. There are only a few controls, which always appear in the same location and perform the same functions.

Usability Test Design

The usability test was run on six participants. Some of the subjects were asked to search first, and some were asked to submit items first in order to simulate different approaches to the interface. A questionnaire and tasks were given to each user and they were watched to record their reactions while they were performing their tasks. Several drafts of the questionnaire and tasks were examined until only the questions that would help in the evaluation were kept. The pre-test asked the user about their familiarity with the internet and their web browsers, as those could influence their perception, as well as their knowledge of Terrapin Trader. The post-test questions focused on several 1-10 rankings of the reactions to various parts of the site including colors, error messages, and general design as well as open-ended questions about sections that could use improvement as well as features that are well implemented currently. The usability tests were conducted with one of the group members watching the user using the site, and taking notes while they are navigating. The user was warned before-hand that they are not being tested on their performance, and that the interface is the website is the thing being tested so that they do not feel intimidated by the note-taking and if they encounter any problems.

When user tasks are described below, all of the comments from the users were not noted as there were a lot of errors found in the website as well as modifications that could be made, and those were noted only in the spreadsheet documenting all suggested modifications. Only the bugs and modifications that the users found the most important were described in their descriptions.
Age: _____ Gender: __male__female

NOTE: You are not be evaluated on your performance in using this interface. The website/interface is what is being evaluated. Please write down any problems that you have so that the site can be improved.

1. Have you ever heard about Terrapin Trader before?
   YES          NO
1(a) If so, have you ever used it before
   YES          NO
1(b) If you answered YES above, please elaborate on that experience below:

2. Have you ever utilized any other surplus product sites before?
   YES          NO

3. To what extent (on a scale 1-10) are you familiar with the current web browser?
   Very Familiar 1 2 3 4 5 6 7 8 9 10
   Novice

4. What category would you classify yourself as?
   Student     Professor     Administrator     Other

How many hours a week do you spend on the Internet? _______
**Scenario input data user:**
1. http://terrapintrader.ueuo.com/db <-- navigate here
2. Navigate to ‘About us’ and read about the website
3. Navigate to ‘New User’ and create an account using a umd address and sample information
4. Login
5. Navigate to ‘Submit Surplus’
6. Enter ‘desk’ as a new surplus item (fill in other fields with whatever you choose)
7. Contact the maintainers of the site asking them where the Terrapin Trader site is located.
8. Logout
9. Navigate to create an account
10. Try to create an account using a non-umd email address – note the error message
11. Log back in using your previous account
12. Navigate back to ‘Submit Surplus’
13. Submit a computer to the database. (fill in other fields with whatever you choose)
14. Navigate to the home page
15. Navigate to your profile
16. Edit your phone number to 2222223222

**Scenario admin user:**
1. Login using a given admin account
   
   | login: stohro@mail.umd.edu |
   | password: 732000 |
2. Navigate to Manage Surplus
3. Select the request that was submitted the longest time ago
4. Approve the request setting price to 100$
5. Select the request submitted the longest time ago
6. Reject the request
7. Logout

**Scenario search user:**
1. Navigate to ‘Find/Browse Surplus’
2. Search for a ‘desk’
3. Find the first desk that is available that can be bought by the general public
4. Search for a chair with armrests
5. Navigate again to ‘Search for Surplus’
6. Find a computer that is listed that has the lowest price
7. Find a lamp that is less than 10 years old
8. Browse all of the items in the athletic category and under 10 dollars

[Figure 18] User Tasks. A search-first scenario was also used.
Please circle the numbers which most appropriately reflect your impressions about using this site. Please use the space under the questions to write any additional comments that you might have. Not Applicable = NA

<table>
<thead>
<tr>
<th>Overall reactions to the system:</th>
<th>terrible</th>
<th>wonderful</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characters on the screen</th>
<th>hard to read</th>
<th>easy to read</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Screen Layouts</th>
<th>hard to navigate</th>
<th>easy to navigate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of terminology</th>
<th>inconsistent</th>
<th>consistent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Keeping you informed about what is going on</th>
<th>never</th>
<th>always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tasks can be completed</th>
<th>with difficulty</th>
<th>easily</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error messages displayed</th>
<th>annoying</th>
<th>helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colors used are</th>
<th>inadequate</th>
<th>adequate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How likely is it that you would use this site</th>
<th>very unlikely</th>
<th>very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 NA</td>
<td></td>
</tr>
</tbody>
</table>

**General questions**

1. Did you in general understand the procedure of the submission process?

2. Was the website easy to navigate?

3. What was the worst part of the website?

4. Are there any features that you would like to see added to the website?

5. Do you have any other suggestions for how the website can be improved?

6. Did you enter data first or search first?

Please write any additional comments below.
Usability Test Subjects

User 1 was a 22-year old female college student Computer Science student who uses the internet for about 45 hours a week and is very familiar with her web browser. She has used Terrapin Trader before for work (she works for the University part-time) when she submitted some items there. She had to fill in a form, fax it in and then wait for a call about a time that the items could be picked up.

The user entered data first, then performed administrative functions and then searched for items. She really enjoyed the design of the webpage and thought it was pleasing on the eyes and easy to understand where to navigate as the next step. She was generally annoyed at the number of pop-ups that were present at the website. She found the page to be a better way of approaching the database better than the paper format and the current Terrapin Trader site. She had quite a few comments about the site. She noted several spelling mistakes around the site. She noted that she would prefer pick-up times to be in 15-minute intervals as it is better for scheduling. The user also noted that she was logged-off when she navigated to the front screen after clicking the logo. The user did not understand the design of the search/browse utility. She could not search for a “chair armrests” even though an item with the description of “chair with armrests” was found in the database. She wanted more functionality in the search including the ability to search for items that were in the athletic category instead of only being able to browse to the category. She also found the crucial bug of being able to edit the information about the items found during the search—this ability was not locked only to administrators.

Even though she didn’t encounter many problems with deciding where to navigate, she noted that it would be nice to have ‘tooltips’ and links to the FAQ next to titles so that users could easily have questions answered and clarifications on what each of the sites meant.

After the usability test was performed she had a general positive response to the website and said that she was very likely to use the site in the future, especially to submit items through her on-campus job. She liked the design and navigation of the website, but found it important for the administrative functions such as re-editing items to be implemented.

User 2 was a 24-year old male graduate student in Mathematics at the University who uses the internet for about 20 hours a week and is fairly comfortable with his web browser. He has used Terrapin Trader before to buy surplus as a student, and found it to have a not very interactive website from which it was hard to understand the process of buying things from Terrapin Trader.

The user inputted items first into the database. He found that the process was easy and did not run into any difficulties, though he noted that this was partially due to the fact that he was already familiar with what Terrapin Trader was and that the items could not be purchased online. He noted that for a real first-time user this could not be the case and more warning about the purchase-system should be present apart from on the About and FAQ pages. An item that he really wanted to be added to the website was pictures of items. He also wanted for there to be sub-categories for items so that it would be easier to browse for items in a sort of ‘tree’ structure. He also noted that an item might
be applicable to several categories and it would be good to tag it as such. He noted that this could be an optional field, but it would greatly enhance the browsing. The user’s first reaction when arriving at the search page was confusion because he thought there were no items in the database since no default list of all items in the database was displayed. He was frustrated with the limited search capabilities and the fact that users could not sort items based on the different columns that were displayed in the search.

Overall, the user said it was unlikely that he would use the site. Though he found the general design and appearance of the site good, he found that it was missing basic functionality and needed major modifications before it could perform all the tasks necessary for success.

User3 was a 22-year old male undergraduate student in Aerospace Engineering at the University who uses the internet for about 30 hours a week and is fairly familiar with his web browser. He had never heard of Terrapin Trader before.

The user inputted items first into the database. When first creating an account, the user was extremely frustrated when he had to enter his information in several times as he kept making mistakes and the account-creation form was cleared every time. Then after submitting items to the database, he realized he made a mistake, and found that there was nowhere he could go to view the items he submitted and edit their information. He noted that the administrators of the site could be contacted, but it would be an extra unnecessary step for editing simple information. The user pointed out several spelling mistakes throughout the website and noted that they distracted from how seriously he took the information that was displayed. He also noted that when he navigated to change his phone number in his profile he was capable of entering ‘22222222222222222’, signifying no error checking in modifications to the profile. When performing administrative tasks, the user found the interface to be simple, but was annoyed at the fact that he could not approve and reject items at the same time—he would prefer an approve and a reject column when performing administrative tasks to speed-up the task. He accidentally approved the wrong tasks and found that there was nowhere he could go to undo the action. He would prefer there to be a part of the management of the database that would list all the items in the database and allow edits to them. Alternatively, he noted that it was possible to edit items that were searched for in the browse/search utility (a bug). This action could be blocked from non-administrative users, but kept for those logged in as administrators. This could provide a search utility as well as editing for administrators.

After performing the search, the user tried to click on the items in order to buy them. He did not understand that items could not be bought online. He also did not understand what it meant for items to be available to the public versus only to administrators based on the Terrapin Trader timeline of item availability. He said that a first-time user such as him would appreciate more of a notice at least on the top of the search utility that would explain the process, as well as a column in the search that would state if he was capable of buying the item at the current time. He also had a problem remembering the search criteria that he used, and found that it was not displayed after the search was performed.

Overall, the user found the website to be good, though he noted that the suggestions he made should really be implemented before the website can be really user-
friendly. He was most frustrated with the lack of stress on submission pages about which fields need to be completed and the fact that incorrect forms were cleared. With these changes (and more noted later in the write-up) he said that he was very likely to use the website as well as Terrapin Trader.

User4 was a 52-year old female lecturer in Computer Science at the University who uses the internet for about 30 hours a week and is extremely familiar with her web browser. She has heard of Terrapin Trader before but never used it.

After inputting her information into the website, the user was delighted to see a welcome message displayed using her name, but realized that she misspelled her own name. When she went to her profile and changed it, she noted that it did not change on the front screen—a bug. She also tried to log in with just her username (not email). She noted that even though she immediately realized she should log-in with her email, it would make sense to allow users to login with just their username because all emails have to end with umd.edu anyways.

When she first performed a results search, the user asked why nothing was found. She then noticed that the results were further down on the screen, as she was using a larger font than other users which forced the results out of sight. She noted that she would prefer the results as well as the search criteria (currently missing) to be displayed at the top of the screen. When asked to search for items in the athletic category, the user typed ‘athletics’ into the search toolbar and did not realize that she could browse for them in the browse function. She noted that it would make more sense to combine the browse into the search function as ‘advanced options’.

When submitting a desk to the database, the user laughed at the question of ‘Is the item functioning?’, as desks don’t generally function. She remarked that a better phrasing would be asking if an item was in ‘good working condition’, as this could apply across the board. She also noted that even though it makes sense that the building that she registered at would be the default location of submission of an item, she might be submitting an item located somewhere else on campus, and a field of item location in the submission tab would be helpful.

After the tasks were completed the user stated that the site was easy to navigate, even if she was not following the specific user directions. Her main complaint about the site was the limited search/browse functionality.

User5 was a 24 year old male student at the University of Maryland. He uses the internet on average about 30-35 hours a week. He had never heard of the Terrapin Trader site and had never utilized a surplus product site before. He felt that he was somewhat familiar with his web browser. He did not consider himself an extremely proficient computer user, but felt that he knew enough to get by.

As the input data user, he felt that the submission process was relatively easy. He was a bit put back at first when he couldn’t remember his password, but was able to figure it out shortly. He suggested that a password recovery form would be helpful. While he was an administrative user he was fairly interested. At first he was confused about which requests to approve, so he had to go back and re-read the directions. Once he read the directions again, he understood what to do and the rest of it went smoothly. While
User 5 was the search user, he felt that it was easy to browse through the items. He did not have much of a problem finding any of the assigned items to find on the website.

Overall, he commented that it was a neat website and he felt that he might use it in the future. He thought the screen layouts were organized and easy to understand. He understood the procedure of the submission process. He also felt that the website was fairly easy to navigate. The only feature he felt would be nice to be added to the website was adding in the link that a user could click in case they were to forget their password. He searched around on the website first, before he filled out any data. Overall, he thought it was a productive and easy to use website.

User 6 was a 22 year old female student at the University of Maryland. She uses the internet, on average, about 42 hours a week. She is also very familiar with her web browser. She had previously heard of the Terrapin Trader, she had driven by the building on Paint Branch Avenue; however she has never used the website before. This user entered data first; next she performed administrative functions, and then searched for items.

While she was creating her account, she had to go back and re-type her “Login name”. She did not realize that she had to enter her full e-mail address and at first assumed that she only need provide her university user name. She recommended that it would be easier considering everyone at UMD has the same ending to their email. She found submitting the desk and computer to the Terrapin Trader to be very simple. She thought it was easy to navigate to and use “Submit Surplus”. She also stated that editing any of her profile was simple.

User 6 did not have a problem doing the administrator’s duties from Terrapin Trader. However, it did take her a minute try to figure out where to approve the request setting price to $100. Rejecting the request submitted went smoothly for her. She ran into a problem while she was searching through the “Find/Browse Surplus”. She could not find a chair with arm rests however; everything else that she was searching for was easy to find. She made a suggestion that users be allowed to search everything that is submitted into the Terrapin Trader website in the order of which the items were approved, without having to fill out a search request. She thought that this would be beneficial in case you were not sure of what you wanted, but you still wanted to search around and see what all the site had for sale.

She enjoyed the overall layout and style of the website however, she thought that the light pinkish red of the website would like nice if it were changed to a bolder red, to match school colors. She appreciated the clarity and organization of the website and felt that it was simple for her to use. In general, she thought that it was easy to login and to log out. Overall, she thought that it was a good website and was easy to use for the entire range of users. She thought that the website will greatly benefit all members of the University of Maryland.
Usability Test Results

The post-test results are shown below. The graph and its accompanying chart show the answers to the 1-10 rank questions in the post-test questionnaire. The larger chart shows all of the bugs and modifications that were suggested by the users.

<table>
<thead>
<tr>
<th>Question</th>
<th>User1</th>
<th>User2</th>
<th>User3</th>
<th>User4</th>
<th>User5</th>
<th>User6</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Reaction (terrible/wonderful)</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>9</td>
<td>6.83</td>
</tr>
<tr>
<td>Overall Reaction (difficult/easy)</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>6.67</td>
</tr>
<tr>
<td>Characters reading (hard/easy)</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>10</td>
<td>8.50</td>
</tr>
<tr>
<td>Screen Layouts (hard/easy)</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>6.67</td>
</tr>
<tr>
<td>Use of terminology (inconsistent/consistent)</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>7.83</td>
</tr>
<tr>
<td>Keeping user informed (never/always)</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>7.83</td>
</tr>
<tr>
<td>Tasks completed (with difficulty/easily)</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>8.00</td>
</tr>
<tr>
<td>Error messages (annoying/helpful)</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>3</td>
<td>6.83</td>
</tr>
<tr>
<td>Colors used (inadequate/adequate)</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>7.50</td>
</tr>
<tr>
<td>Likelihood of using site (unlikely/likely)</td>
<td>8</td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5.17</td>
</tr>
</tbody>
</table>
**User Responses**

<table>
<thead>
<tr>
<th>Priority</th>
<th>Time Req.</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task/Comment</strong></td>
<td><strong>Priority</strong></td>
<td><strong>Time Req.</strong></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td>-can't put in an extension for phone numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-some people type in phone numbers as 222-222-2222 but we just have a box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-there needs to be a ‘Login’ label above the login section on the left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-when name is edited in the profile it does not appear on front page welcome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-results should be moved to the top of the search screen -- if you have big font you can't see them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-results criteria should be displayed after the search is done</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-the indices of the search should start with 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-users wanted to be able to sort the results based on the different titles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Also for the search, if you want things in athletics you can't just search for athletics -- it only looks at the names of the items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-the default of the search/browse should display all the items -- it looks like there is nothing in the database at all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-there should be some sort of a note about how you need to register in order to list items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-while adding an item it should be “in good working condition” rather than “functioning”. A desk does not</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issue Description</td>
<td>Rating</td>
<td>Urgency</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Should add &quot;Where is Terrapin Trader?&quot; in the FAQ</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Want to pick a location during the submission -- it can default to where person is registered are but it should be editable</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Should serial numbers have error checking?</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>When adding an item in and you make a mistake... it all is gone! You need to save the form.</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>There should be a section for where the items that users listed are shown -- for changes and to know if confirmed</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>&quot;Message successfully sent&quot; &lt;-- misspelling for when contact form is submitted</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>When it is stated that a UMD account is required in order to create an account can state that you need to have a umd.edu address</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Editing an account does not have error checking -- a user could edit his account to say 22222222222222222222</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>It is non-trivial to realize that you just have to click on parts of your information to edit them</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>There should be both a 'approve' and 'reject' column for the administrators so that you could do all your edits at one time</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Since there are sometimes discounts needed to be applied there should be a better way of applying the discount</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>When you add 'desk!!!!' into the database and then search for 'desk', it would not show up. Need to search within the phrases</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Also when searching for 'chair armrests' will not find 'chair with armbands' -- should separate search terms</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Need to have some sort of a note about when things are available to the public to know which items can be bought to whom</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>There should be a note on the top of the search page that notes that items can NOT be bought online and you have to go to the facility</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Why do you need to select two options to browse with?</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>It is possible to edit items as they are searched for by anyone</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>It would be helpful to have tooltips next to directions</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>It is not possible to remove items when they have been sold</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pick-up times to be in 15 minute intervals</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>User is logged-off after when they click the logo</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Adding posting a picture</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Administrators should be able to edit items that they have approved already as well as revert items that they have rejected</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>A pick-up time scheduling system can be added. It is implied that this is done via-phone.</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Email notifications to the user about the status of their items</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Ability to tag an item in more than one category</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Searching for the &quot;chair&quot; produced no results for a user, need to test search further.</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

[Figure 22] Modifications suggested by users
The results of our usability tests made it clear how large of a project this was to undertake. The number of bugs found and suggestions from users was astronomic, and many of these would take a significant amount of time to fix or implement.

The six users were all fairly experienced computer users, so their experience with the site was not hindered by any difficulties with using the technology. Five of the users were students and one was a member of the faculty. It was unfortunate that more members of the faculty were not available for testing, and most importantly that the Terrapin Trader current webmasters were not available to test the site. It would have been of critical help if the site could have been critiqued by those who might decide to edit in the future.

Based on feedback from the user tests, we found the general design of the page to be well-received, though not perfect. We discovered several bugs in the screen navigation through the process, and have heard many suggestions of features users would like to see added.

The section that had the lowest rank from the users was the likelihood of them using the site in the future. Users noted that this was an honest assessment of how useful the site was to them, and that since they are not administrators, they cannot submit surplus, and would most likely just go straight to the facility to see the items that were available if they chose to make purchases.

The sections that received the highest ratings were the ‘characters of the screen readability’ and the ‘ease of completing tasks’. It is in the opinion of the group that the most important thing for the user to be able to complete their tasks easily, so the interface has to be fairly successful.

One of the main complaints from users was the performance and appearance of the Browse and Search pages. It was unclear to every user we tested what the difference was, and why the two could not be used together. Several of the users pointed out that it would be best to combine the browse and search utilities into a single search with several options.

Many of the suggestions from users are easy to implement and it is easy to see how they will benefit the site. Additional error checking to things like catch spelling mistakes, simple formatting, spelling mistakes and adding FAQ pages are such examples. Some comments needed to be examined further to examine merit and feasibility. Users requested more administrative functions for post-approval. Some of our testers also asked for more functionality for sorting search results and in performing other administrative tasks. Not all of these modifications can be followed through based on the time available for the project.

Figure 22 shows all of the suggestions given by users. They were ranked based on their priority as well as the difficulty in implementation. The priority was given based on the need for these changes to be available for use with the Terrapin Trader database. We found that many features that would be necessary in a fully-functional database were not included, and if the site was to be used at the time of testing a lot of functionality would not be available.

*Final Prototype Modifications Process*

After usability tests were concluded, the group had to decide which of the suggestions given by users were to be implemented. It was decided that it would be
impossible to implement all suggestions given the time constraints, and it would be best to perfect the functionality that was already present, rather than add new functions. The framework and documentation inside of the code can be left open if the website is later edited and put into circulation.

The corrections involving spelling and clarifications were immediately implemented. More FAQ were also added as well as longer descriptions on top of many screens.

The main problem that users had with the interface was the separation of the search/browse function. It was decided that this feature would currently be kept in two separate functions. The search functionality was expanded to search within descriptions and by keyword, but it was decided that the functionality would be kept separate as long as we added the display of the search/browse criteria for the user to understand what they did. It was also decided that the browse function was useful for users who do not have a particular exact product that they are looking for. The browse function is more vague and allows for more options to be selected. Nevertheless, the group admits that this section is rather confusing and this functionality should be changed for a final release.

The usability tasks were incredibly helpful in finding problems and potential modifications to the design. It is in the hopes of the group that the features not implemented at the current time can be implemented in the future to create as close to an ideal interface as possible.
Conclusions

The final design implements the core tasks necessary for basic operation of the Trader, but it does not accomplish everything that we set out to include. It was decided that due to the scope of the project, it would be more important to focus on perfecting the features that were implemented in the prototype rather than adding new features that would be useful in a fully-functional final design. The final design can be found at: http://terrapintrader.ueuo.com/db/

The final design allows a user that wants to submit items to create an account, edit their account, and submit items to the database. An administrative user is able to approve/reject requests as well as edit their information during the approval process. A searching user is able to either search for items by keyword, or browse for items by category, price, and age.

There were several major modifications that could have been enacted had more time been available. Many of these were suggested during the usability tests and found to be of great importance, but not possible at the current time. For example, it would have helped the user as well as the administrator to be able to modify submitted items to fix mistakes or remove purchased items to save the administrator time. In the final prototype it is not possible for the user to make modifications to an item that they submit, and it is not possible for an administrator to change the information about the items that they submit. Also many users had a problem with the browse/search mechanism that did not allow the user to use the search and browse functions together. Efforts were made to improve the actual search mechanism, but it would have been more beneficial to combine the search and browse into a search with advanced options. It would also have been useful to create an e-mail system that would notify the user when their items are approved or rejected. As this is only a prototype it was decided that sample users would not appreciate currently receiving email about items they do not actually possess.

The site could also improve by better addressing some HCI principles, as described previously. It would be good to create tooltips or help screens linked in more places that would provide answers to frequent questions that the user could have while performing tasks. More potentially useful features can be found in Figure 22 in the last column.

These features are all important, and the site is not fully functional until they are implemented. Still, we feel that the prototype is a great starting point for a future reworking of the Terrapin Trader.

The original goal of the project was to be able to integrate the database system with the Terrapin Trader website. This did not occur this semester but the work done will be available for the Terrapin Trader staff for the future so they can integrate or use parts of our work. If this integration is performed it is possible that some new features will need to be added, so the framework of the site code is straightforward and well documented to facilitate future modification.

It is also noted that more usability tests should be conducted on newer revisions before this site is deployed for use. The usability tests proved extremely valuable for finding problems with the site. We found that the fresh perspective of a new user often reveals bugs that were overlooked by the designers. Also the usability tests provide a real look at where a user struggles in the procedure while watching them perform tasks.
The Terrapin Trader Transformation project has taught the group a lot about the design and development process for a large-scale application. The group followed the main stages of the design cycle, and learned the importance of considering the end user while designing the interface. This valuable lesson is applicable to most any type of project in the field, and is often critical to its success.

The group also learned how to delegate tasks and work as part of a team with different skills and responsibilities. This assignment has been an amazing learning experience for the entire group, and it is in our hope that our work will be put to use in the real Terrapin Trader website.
Acknowledgments

The members of Terrapin Trader Transformation would like to thank all of the participants in the usability tests. We would also like to thank Terrapin Trader for the use of their website, name, graphics, etc and their feedback. We would also like to thank our professor, Dr. Ben Shneiderman and our TA, Nir Peer for their feedback on the progress of our project. Finally we would like to thank everyone in CMSC434, Fall 2008 for their discussions and input to our design as well as all the guest speakers for their input on HCI practices.
References


