PureFoods
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Overview

Recently, food safety concerns have been in the news with a salmonella poisoning incident linked to fish that was underprepared and unsafe. As this issue is not likely to be rendered obsolete any time soon, we felt it was imperative that users have an option to facilitate the safety and organization of their food. To achieve this, we have been developing an system which will monitor information related to food safety, namely a time sensitive inventory to maintain information about current stock, a light sensor to safeguard from light contamination, and a temperature regulatory system that will issue warnings should storage conditions become unsafe. This project shows the evolution of product as it goes from low-fidelity to mid-fidelity prototypes and undergoes initial interface testing. Each of the core components of our system were tested and some modifications were made as a result of some usability issues.

Low-to-Mid Fidelity Prototype Description

Our mid-fidelity prototype, PureFoods application, was built by Balsamiq Mockups¹, including 22 mockups buttons, tabs, and images linked together as a simulation of a real world application for user testing. The majority of the pages had a back button for users to go back to the main menu. The main menu of our prototype² contained three buttons. The user was guided to food history, refrigerator monitor, warning history, and food inventory. If the user clicked on the first button, “Foodatrium”, then he/she was led to food history and the refrigerator monitor screen³ in which we had five aspects in five ellipse buttons. “Temp”, “Light”, “Camera” functions focused on the status of refrigerator which provided real-time and history data of the user’s refrigerator. It was designed so the user could always drag back and view the history. In contrast, our mockups had only one unmovable page for each aspect. “Favs” and “Villains” kept track of the user’s dietary habit. Villains⁴ had a food list which contained foods that the user should avoid. The next component connected to “Danger Zone”⁵, which means the foods’ warning history. All the warnings were arranged in chronological order by date and time. The user could click each warning to view more details. Warnings included a detailed report on time and event. If a food warning⁶ appeared, then there were linked to corresponding foods. Warning history also used pop-up windows⁷ to notify user. The third component connected to the “Command Center”, food

¹ https://umdhci.mybalsamiq.com/projects/purefoods/grid
² Appendix 1
³ Appendix 2
⁴ Appendix 15
⁵ Appendix 4
⁶ Appendix 6
⁷ Appendix 16
inventory, in which the user would see a list of food icons in the view section. The border circle of each food icon would appear with different colors as food status changed, i.e.: red for expired foods and green for fresh foods. User could drag the food icons to rearrange the order, or he/she can click the order tap which will automatically sort the foods. User could view a detailed report of each item by clicking on the icon. The detailed information page included purchased and expiration date. Moreover, it supported food quantity and quality information through images along with button links to websites with recommended recipes. In that way, it would help users to consume foods which are close to their expiration date. User could use the add and remove tabs to edit things in Command center. In add tab, user could either scan the whole receipt or type in information about each food item. In remove tab, user would click the cross on the top right corner of each food icon and confirm the deletion from a pop-up window.

Low-to-Mid Fidelity Prototype Testing
(All)

1. Participants

Most of our participants were current liberal arts majors at the University of Maryland. One of our participants was an older, middle-age man. The participants were chosen based on random selections from non-technical courses, roommates, and extracurricular activities. Most of time, they feel comfortable to use their cell phones to check email or browse the web. Also, all of them have some basic understandings and are able to handle some easy social apps such as Twitter. Although, there may be some gender bias with our experiment because we had one female participant and three male participants.

2. Study Environment

Most of our experiments were performed in a computer lab. We had each of our participants test our interface through the computer because our mid prototype was designed with balsamiq software. The computer lab consisted of computers screen sizes ranging from 15” to 19” wide, so the user had a clear and large view of our interface. There were a few other unknown students in the lab, but they didn’t serve as a distraction to the participants during each testing experiment. Some of our testing was also done through our team members’ laptops in a classroom environment. For each experiment, one team member would set up the camera and videotape the session, another team member would demonstrate and assist the user through the Mid prototype, and the other team members took notes during each experiment.

3. Tasks

We had our participants perform three main tasks on our interface. First, each participant

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8 Appendix 8
had to pretend to scan in a sample receipt into our application’s database (also known as The Command Center). Afterwards, the user had to check whether the database was updated with the new items from the receipt. Next, the user was asked to check the Danger Zone section of our interface for any warnings on expired foods. Lastly, each user was directed to check the temperature and lighting history of their refrigerator through the Food-atrium section of the interface.

4. **Procedure**

At the start of each experiment, we had one of our team members demonstrate basic features of the interface, recite some detail information about balsamiq, and briefly explain the meaning and use of our application to each user. Then, there was another team member setting up the camera equipment for each experiment. The other team members took notes during the experiment. Often times, we would exchange roles between each team member depending on people’s availability and different participants. At the conclusion of each experiment, we would ask the participant a few questions on how he/she felt about our application and its usability.

5. **Test Measures**

We intended the participants to only take at most five minutes to do all of the assigned tasks on the interface, but the time varied for each participant. The time duration to complete all the tasks approximately ranged from three minutes to ten minutes. Some of the participants played around with all the buttons, links, and images before getting through one task. The participants experienced a lot of trials and errors using our interface even though a demonstration was done beforehand. Some participants quickly completed each task while others were stuck at one screen.

6. **Results**

As a result, we found out several improvements needed for our application. Mainly, the interface was not understandable to the average user. In the beginning, each user was confused on how to navigate through our interface. All of our participants had to go through a lot of trials and errors to complete the assigned tasks. We learned that several items in our interface were not easy to infer by our participants mostly due to our word choice, images, and layout. We also didn’t properly explain and demonstrate our equipment to our participants because they lacked a complete understanding of our equipment and interface.

**Interface Revisions**

Firstly, we changed the names of the three main components in our interface. Foodatrium,
Danger Zone, and Command Center was changed to Food Information, Food
Expirations/Warnings, and Command Center will remain the same. We also decided to avoid
abbreviating terms in our interface instead use full words. For example, the main menu in the
previous Food-atrium section had Temp, Favs, Light, Villains, and Camera. Temp, Favs, and
Villains was changed to Temperature, Favorites, and High Risk Foods. The participants found it
more feasible and quicker to remove items from the View screen instead of having another
section on removing items. We added a remove option to each item in the Command Center.
The participants didn’t understand the meaning of the temperature and lighting graphs. They
advised us to include more details on the graphs. Most of the participants felt like our images
were not always self explanatory, so maybe we should use some more dialect in our interface.
Additionally, the participants didn’t like how the back button sent them back to the main menu
instead of to the previous page, so we made those necessary changes to our interface. There
were other suggestions on providing both Fahrenheit and Celsius temperature options in the
Temperature portion of our interface.
Pure Foods
You Are What You Eat

1.0.9.0
Pic

Command Center

<table>
<thead>
<tr>
<th>Milk</th>
<th>Salad</th>
<th>Eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Ingredients</td>
<td>Food Warning</td>
<td>Command Center</td>
</tr>
</tbody>
</table>

Command Center

<table>
<thead>
<tr>
<th>Meat</th>
<th>Adol View</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

High-risk Foods

Things are turning bad!

<table>
<thead>
<tr>
<th>Pic</th>
<th>Eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pic</td>
<td>Milk</td>
</tr>
<tr>
<td>Pic</td>
<td>Lobster</td>
</tr>
<tr>
<td></td>
<td>Baked</td>
</tr>
</tbody>
</table>
Summary

We have learned remarkably from the lo-to-mid fidelity prototype testing especially on the user testing part. During the experiment, our users have pointed out the parts they thought were good as well as the parts they thought needed more improvement. From those invaluable feedbacks, we have recorded the problems that mostly confused our users. For example, some names of our prototype’s buttons are not intuitive enough to allow users to predict the actual purposes. Also, people would find it helpful if we gave maybe one sentence description or a subtitle in our Villains screen to describe the purpose so they wouldn’t be confused about if the Villains screen was warning them about the item’s ingredients or the item’s quality.

However, our biggest prototype designing problem has emerged in the command center. Mostly, all participants were confused on how to make a correct command in the command center. For example, they did not understand what the purposes of the pop windows were in the order screen. Did the order button serve as a new order of food items or reorder the existing items? In addition, it would be much more user-friendly if we combine our view and remove screens together so that users could simply remove items on the view screen.

Besides the main design issue in the Command Center, there also existed some minor issues such as the temperature and light graph were not detailed enough and abbreviations on names should have be discarded. Moreover, some participants pointed out the back buttons on several
screens would directly go back to the home page instead of the previous page.

Overall, the low fidelity prototype testing has provided us a great amount of useful feedback to improve our prototype design. Even though we have encountered some serious designing problems. We would modify and ensure that the PureFoods is easy to use for everyone based on the feedbacks from our user testing.

**Video Report**

Before conduct the videotaping process, we showed all participants how our both paper prototyping and Balsamiq prototyping worked, how our system generally worked, and gave each participant an example of something specific that is sufficiently different from our tasks in order to avoid showing them our actual research tasks.

Mostly, the videotaping process was pretty feasible and consistent during each experiment. We had a little difficulty setting up the equipment to capture a great view of both the interface and participant. After testing the videotaping on each other, we realized that it was difficult to get both the participant and interface through our camera. We encouraged each participant to clearly narrate while completing each task on the prototype.

After compiling the video, there was MUCH more footage than we could have possibly used in a 2 minute presentation, so we selected the video with the highest quality “talk-through” in order to give a representation of what testing was like. We selected footage that showed his walk-through of each major task, which demonstrated some of his major likes and dislikes of the system. At first, we attempted to make a split-screen format in which multiple scenarios could be seen at once, but there was no good way to have the audio that documented the user’s thoughts as he used the interface. Listening to 4 separate streams of audio was confusing, while only having one was misleading. In the end, we opted to select one participant to be our showcase test case and edited his video for time alone.

The video can be found here: [http://dl.dropbox.com/u/11233286/New_PureFoods.avi](http://dl.dropbox.com/u/11233286/New_PureFoods.avi)

The videos proved instrumental in showing us things to improve upon. Some points could be attributed to lack of background with the device, as certain functions would have been more familiar had someone searched out the program. Also, the program needs to be more intuitive in its final iteration.

**Appendix A**

**Consent Form**
The PureFoods application is being produced as part of the coursework for the University of Maryland, College Park Computer Science course "CMSC434 Introduction to Human-Computer Interaction". Participants in experimental evaluation of the application provide data that is used to evaluate and modify the interface of PureFoods. Data will be collected by interview, observation, and questionnaire.

Participation in this experiment is voluntary. Participants may withdraw themselves and their data at any time without fear of consequences. Concerns about the experiment may be discussed with the researchers (Will Smallwood, Mengyi Miao, Kerese Wright, Haoyue Wang) or with Professor Jon Froehlich

*The instructor of CMSC434:*

Dr. Jon Froehlich  
Computer Science  
University of Maryland, College Park  
jonf@cs.umd.edu

Participant anonymity will be provided by the separate storage of names from data. Data will only be identified by participant number. No identifying information about the participants will be available to anyone except the researchers and their supervisors.

I hereby acknowledge that I have been given an opportunity to ask questions about the nature of the experiment and my participation in it. I give my consent to have data collected on my usage and opinions in relation to the PureFoods experiment. I understand I may withdraw my permission at any time.

Name ____________________________________________  
Date ________________________________________  
Signature______________________________________  
Witness name___________________________________  
Witness signature________________________________

Appendix B

**EACH PARTICIPANT MUST PERFORM THESE THREE TASKS**

**Task #1**

The participant is given a receipt and he/she must scan the receipt in the database which is found under the Command Center and check whether the database was updated.

**Task #2**
There is a warning notification. The participant must check on the details of this warning under the Danger Zone.

Task #3

The participant must check the temperature and lighting history on their refrigerated foods under the Food-atrium section.

Demo Task

A team member demonstrates the interface and prototype by showing the user how to view his/her favorite foods found under the Food-atrium section of the interface.

Appendix C
4. Danger Zone

7:38 PM
Thurs, March 20

5:31 AM
Thurs, March 27

5. Temperature exceeded:

7:38 PM
Thurs, March 29
Temperature exceeded:

10 °C