Sustainly

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Overview
One of the best ways for organizations to become more environmentally friendly is to use products that are beneficial to the environment and energy efficient [1]. Unfortunately, green products aren’t always the cheapest option, so some organizations are having trouble balancing “environmental-friendliness” with their overarching goal of increasing profit margins. Large companies such as Unilever, IBM, and Frito-Lay have stated that they are interested in technologies that would help them go green [1]. Our proposed solution to this problem is a browser plugin that would assist companies in considering energy-efficiency and environmental-friendliness when making purchasing decisions. This plugin integrates additional useful information into Amazon product search results. Its unique features allow users to compare energy ratings and reviews among products, understand environmental benefits associated with a product, and visualize energy savings resulting from purchasing a product.

Prototype
We designed our mid-fidelity prototype in Balsamiq. We improved upon the prototype from our last assignment by adding in links from each button to other storyboard pages. Our previous prototype had just been a group of separate storyboard pages without any linking between them. Adding in these links allowed our testers to actually click through the interface as if it was a real browser. In addition to adding in linking, we went through all of our previous interface pages and removed many that we didn’t need. We also noticed that there had been some inconsistency in the buttons that appeared on the Sustainly toolbar, so we created a uniform set of options that would appear on each search result page and a set that would appear on each product page.

The start page for each user is an empty browser in which they can click the URL bar and be navigated to the Amazon homepage. From there they can click the search bar to search for a product. Since typing is not supported in Balsamiq prototypes, we just enter the text “www.amazon.com” and “washing machine” upon the user clicking each of the associated bars. Next, the “Go” button can be clicked in order to be taken to an Amazon search results page, as can be seen in Fig 4.1. The search results page is the first place where our interface comes into play. The three top results show products that are suggested by Sustainly and a “+” button is inserted next to each product. The text “Add to Analyzer” is supposed to appear when a user hovers over a “+” button, but because Balsamiq does not support hovering, we just had that text display at all times in our prototype. Additionally, our toolbar comes up at the bottom of the screen with the two options “Settings” and “Analyzer.” Clicking the “Analyzer” option on the toolbar will allow an embedded window to come up from the bottom of the page displaying a graph comparing products (Fig 4.2). Within the Analyzer window, the user sees a graph view comparing the products he has chosen based on cost versus time. On the right side of the window there is a list of graph options so that the user can see graphs comparing different features of the products.
If a user clicks a product, then they will be taken to an Amazon product page, which is where the second part of interface appears. The toolbar at the bottom of the product page has two options, “Energy Details” and “Reviews” (Fig. 4.3). Clicking either option will make the embedded window come up from the bottom of the page and display the content that the user wanted to see (Fig. 4.4 and Fig. 4.5). Different options can be toggled between while the window is up, or the user can close the window.
Testing Method

Participants
Sustainly can be used by anyone who makes frequent corporate purchases on Amazon. Since our prototype is directed towards Amazon users, we chose participants that fit our criteria. They were chosen from our target groups to maximize the variety of user feedback. Our first tester, Tapan is a recent Computer Science graduate and part of the IT team at the Center for Advanced Transportation Technology Laboratory (CATT Lab). He often is the person responsible for selecting the various technologies to be purchased for the lab, sometimes relying on Amazon to do so. Our next participant was Fiona, a young small business owner. She often finds herself using Amazon making purchases for her business. While she was not overly concerned about buying green products, she said that she did believe that there was some benefits that could be derived from doing so. James, our third tester, advises individuals making large purchasing decisions about electronics and appliances at the University of Maryland. He provided us with useful feedback in the contextual inquiry stage of our project, and he was excited to see if our plugin could make his job easier. Our final participant was Britney, an operational purchaser for Accenture. Her corporate responsibilities involve making company purchases, controlling inventory, and delivering solutions to clients.

Environment
For each participant, the usability test was held at their work location to help ensure that our results were representative of how they would actually interact with the system. The participant would use whatever computer that they normally used to perform the tasks we ask of them. We would first set up Balsamiq for them, which would be used to display our prototype and simulate a user-browser interaction (Fig 4.1). For the portion of the tasks that required interaction with the actual Amazon webpage, we gave the participants the choice of which browser that they wished to use. However, we did ask that they choose a browser that was representative of the one in which they would normally use on a daily basis while working.
Tasks
Each participant was given a set of three tasks to complete in on both a web browser of their choice as well as our own mockup in Balsamiq. They were first asked to go to Amazon.com and find reviews of a washing machine. If the product that they go to has no reviews, they were to then supposed to find a way to get reviews on that product in any other way that they can think of. If they were unable to find any reviews whatsoever for the product, that would be noted and they would be able to try to do the same for a different washing machine. When this task was completed, they were then asked to close the browser and and reopen it anew. We then asked for them to again go to Amazon.com and this time find a product that was listed as being environmentally friendly and explain to us how they knew this was so. The final task that we had the participants complete was to a little different from the rest. Because there was is no simple way to perform the task, we asked users as to how they would go about visualizing cost vs. time and savings per year for the green product that they found previously. We then had them open up our Balsamiq mockup and attempt to perform this task using the proposed plugin.

Procedure
The participants were asked to perform three tasks in our experiment. While they performed these tasks, they were to voice their thoughts out loud so that we could document any problems that were found with the current design. Two of our researchers were assigned to a participant: one evaluator to record notes and one moderator to provide instruction and assistance to the participant. After each task, we asked the participants for their opinion on the usability and functional design of the interface. They were informed that we would not be grading them on their competency on using the interface, so they could focus on the pros and cons of our design.

For each task, the moderator first explained the mission and purpose of the test. The participant was typically asked to perform actions first on Amazon’s website and then once again with our prototype in Balsamiq. The evaluator took notes of all activity and user feedback he noticed or heard (Appendix 3). After the participants completed the tasks, the evaluator shared his findings with the participants. This gave us a chance to analyze the feedback and receive meaningful input from our test participants.

Once all of the tasks had been completed, we sat down with the participant and discussed how they felt about the system. We had them reiterate anything that they particularly liked or disliked about the system. We then asked them about what they thought could be done to improve these issues and what else they would like to have integrated into Sustainly. The final question we asked was the likelihood of them using our plugin if the aforementioned problems were fixed and the interface cleaned up.

Test Measures
The test measures that we focused on were primarily time and perceived ease of use. When participants were asked to perform tasks on Amazon, we used interaction between them and the site as a baseline for each task. Anything that they seemed to struggle with, we took note of, and attempted to determined the cause of these problems. Specific points in the tasks that commonly caused confusion were noted. These measures allow us to identify unclear interface features and devise appropriate solutions to address the issues. The total time spent by the participants were recorded in minutes. We seek to lower the usage time to make Sustainly more user-friendly and efficient.
Results
The results from our user tests showed that there were potential causes for confusion related to every task. First of all, the two tasks that involved finding reviews and finding energy-efficiency details both required the user to navigate to a product page and then click the toolbar, but users were getting distracted by the Analyzer on the search results page before they even got to a product page.

For the review task specifically, Fiona knew that she would be able to see product reviews from a product result page, but when she executed her search she was distracted by the “Add to Analyzer” buttons on the search result page. She tried to add a product to the analyzer and was confused when the only feedback that she got was the add button changing to a remove button. She then navigated to a product page, but when she saw that Amazon had no reviews for the product, she didn’t even think to click the “Review” button on the Sustainly toolbar. This showed that we need to make it more apparent that Sustainly can pull in reviews from exterior websites even when Amazon has none.

For the task that involved finding an energy efficient washing machine, some users relied on the “suggested by Sustainly” products at the top of the search results page. They could see which of those products were Energy Star certified, and then after clicking on the product result they’d be taken to the product page, from which they could click the “Energy Details” toolbar tab to get even more information. One problem that Fiona had was that she glossed over the text, so she didn’t notice that Sustainly suggested 3 products for her at the top and told whether or not they were Energy Star certified. However, she was still able to view energy details from the product page. She suggested that we make the “suggested by Sustainly” products more noticeable. It seemed that users had less trouble with this task than with the review finding task, but part of the reason for this was that they had already become somewhat familiarized with our interface by completing the review finding task.

The visualization task was the one that we had predicted would be the most difficult, and indeed, many users had trouble with it even though they had already interacted with it during previous tasks. The main problem that users had was that the word “Analyzer” didn’t really mean anything to them and they didn’t know what they were supposed to use it for. Our “Add to Analyzer” buttons were confusing to our testers. Brittany didn’t even know if they were part of Amazon’s interface or part of our toolbar’s interface, and Tapan pointed out that he had no idea what the analyzer was so he didn’t know whether or not he should add things to it. Tapan and Fiona were both further confused by the fact that adding products to the analyzer didn’t open the analyzer, making it was hard to get feedback about what they were accomplishing. After we explained what the Analyzer was to Tapan, he suggested that we display more descriptive text upon hovering over the “+” buttons, such as a sentence explaining that adding products to the analyzer will let you compare multiple products based on energy efficiency. He also suggested that the Analyzer window open as soon as a product was added to it so that users could get feedback instantly. Another problem that arose was a bug in our prototype where a user would be taken to a product result page if they clicked the analyzer with no products yet added. This bug made us realize that we had forgotten to account for that possibility, so we decided to display a sentence explaining how to use the Analyzer if a user opened it with no products yet added.

Furthermore, Tapan believed there should be a better way to compare products using the visualization feature. He said that while it was very useful to be able to visualize this data, there are multiple different types of graphs that can be shown, all giving the user more and more data
to keep track of. He suggested that there be a system in place that consolidates all this data into a single number, easily comparable between two products. This way he can easily tell if it is worth the time to look at their details more in depth or not. If the numbers were very different, he would know he can just choose the better of the two right off the bat.

**Interface Revisions**

Several of our users experienced confusion when attempting to open the analyzer tab without first putting anything in the analyzer. There was no reason that users should not be able to do that, so we created an additional interface that would appear when our users opened the analyzer without having anything inside of it (Fig 7.1).

![Fig 7.1](image1)

Moreover, the add-to-analyzer button and the Analyzer features themselves were not intuitive to use. Before, after clicking the add-to-analyzer button, users received no immediate feedback except for having the add-to-analyzer button change to the remove-from-analyzer button. We modified our interface so that selecting the add-to-interface button would automatically open the analyzer tab. Additionally, we added additional instructions to the Analyzer tab so that users would better understand how to use it and what it was for.

A usability issue that Fiona pointed out was that she did not expect Sustainly to have reviews when she saw 0 reviews from Amazon. To avoid this issue, we modified the interface to show how many reviews Sustainly has next to how many reviews Amazon has. Clicking the link that says how many reviews Sustainly has will open the Sustainly review tab. The previous interface is shown in Fig 7.2 while the new design is shown in Fig 7.3.
Another concern that several of our users had was that they could not always tell which features and what information on the page were added by Sustainly and which were from Amazon. This became an issue when our users wanted to know which page elements were being added by our plugin. To remedy this, we decided to color code page data added by the Sustainly plugin. Fig 7.4 shows a search results page before the change while Fig 7.5 shows one after.

Per Tapan’s suggestion of better product comparisons, we will also change the default graph that is displayed when a user clicks the analyzer button. Now, the first graph to display will be a comparison of the overall “Sustainly Factor” This will be determined by an algorithm that takes into account number of reviews, average review, cost over time and savings per year. The algorithm will be known and changeable by the user to fit their needs.

**Summary Discussion and Lessons Learned**

From our user testing we learned that our interface is not intuitive enough. Many of our features were hidden from users, and users had no way of interacting with certain parts of the system,
for example, the analyzer, unless they already knew how to use it. We remedied this in our design by making a simple explanation of how to use the analyzer and putting it both in the analyzer window and as hover text over “Add to Analyzer” buttons the first time that a user tries to add a product to the analyzer. We also made the review feature more visible by displaying the number of Sustainly reviews next to the number of Amazon reviews to show that Sustainly compiles reviews from places other than Amazon. Even though users thought that our design was not intuitive enough, they said that they liked the concept of having a plugin that could compare products and add information to their product search results.

Even though we uncovered many interface problems, it is possible that there are more things that we didn’t uncover because we may have introduced bias into the experiments by having all of our participants do the tasks in the same order. Each participant had already done the review finding task and energy efficient washer finding task by the time that they got to the visualization task, and some of them had required help on those tasks. This meant that as the tasks progressed each user had a better understanding of how the interface worked, so their experience with the interface when they were working on the third task was better than when they were working on the first task.

To improve future usability evaluations, we might want to randomize the order of the tasks that we have each user complete. This way we’d get feedback about each task from someone that was seeing our interface for the absolute first time and trying to accomplish that task as the first thing. We also might want to get testers from a more diverse background, such as people that are generally unfamiliar with Amazon.

Roles
Kyle Schultheiss - Devise project iteration. Link prototype screens on Balsamiq. Interviewed Tapan and Fiona. Refine tasks and organize test measurement findings.
Dylan Symington - Work on prototype analysis and writeup. Design interface revisions and suggest various solutions. Analyze feedback from participants and writeup of test findings.
Sawyer Symington - Worked on new interface on Balsamiq. Interviewed James and provided new task refinements. Grouped critical findings and meshed it together.
Benson Tran - Create procedure script. Interviewed Britney and evaluated feedback from participants. Analyzed and wrote environment and procedure parts.
Appendix

[1] Procedure Script
1. Introduce ourselves and explain the purpose of Sustainly
2. Ask participants behavioral questions:
   a. What browser do you use at work?
   b. How do you usually use Amazon to compare products?
   c. What factors do you consider before making a purchase?
3. Explain to the participants the voluntary nature of the experiment and the conditions:
   a. Seeking their feedback on the design and usability of Sustainly.
   b. Not measuring their competency of using Sustainly.
   c. Informing them that their input will be used to improve Sustainly.
4. Identify our collective roles of participant, moderator, and evaluator and explain the responsibilities of each one.
5. Present the Sustainly Prototype and briefly demonstrate how to use it.
6. Thoroughly explain the tasks the participants will be performing.
7. Recap the experiment and have the evaluator share their findings and analysis with the participants.

[2] Tasks
1. Find reviews for a washing machine on the Amazon website. If the product has no reviews, determine a method to get reviews on that product. If no solutions are found, try to do the same thing for a different washing machine until reviews have been found for a product. Next, use the Sustainly plugin to accomplish this same task.
2. Search for and find an environmentally friendly product on the Amazon website. Next, use the Sustainly plugin to accomplish the same task.
3. Discuss how you would go about visualizing cost over time and savings per year for the product that you found as a part of task 2. What problems might arise in this process that you can think of? Next, use the Sustainly plugin to accomplish this same task.

[3] Raw Data/Critical Incidents

Tapan
The + (Add to analyzer) button was a source confusion for Tapan, when he saw this he pressed it but had no idea what it was supposed to do or what he was supposed to do next. The “Add to analyzer” text next to it did little to help as he had no experience with it prior. It was not apparent that he would next need to click on the “analyzer” tab of the plugin or even what that would accomplish.

When told what the feature was meant to accomplish, he followed the steps I suggested to him. Upon receiving the data visualization, his first comment was that he wanted something more simplified. Rather than only having cost vs time and annual energy savings, he wanted something that he could use to quickly compare two products. He suggested having some sort of algorithm in place that assigned a numerical value to each product. The factors in it would be the average review score taking into account number of reviews, the cost vs time numbers as well as annual energy savings. He said this would be much more useful to him as it would allow him to make many product comparisons in a very short period of time. He mentioned using this
to be able to weed out “weaker” products from the “stronger” ones. This way when he found products with a similar rating, he could then go on to the more detailed analysis of each in order to make his final choice.

Overall, Tapan said he really liked the idea, however it definitely needed work. He said that if the changes he mentioned were in place, he would definitely use it when searching for products for the CATT Lab.

Fiona
When asked to perform the task of finding reviews for a washer, Fiona was immediately distracted by our plugin. After searching for washing machines, she was greeted with the search results where she noticed the instructions to “add to analyzer”. Despite this not being related to the review’s task, she happily obliged the system’s instruction and clicked the + button. When this happens and there is no apparent feedback other than it now being listed as “- Remove from analyzer,” she is thrown off. When asked about it, she said that she knew she could find reviews on the product page, however, thought that the plugin’s instructions would somehow help her do the same thing in a more simplistic manner.

When she is told that no reviews could be found from what she was attempting to do, she gave up and clicked the product she wanted to get the reviews of. Because the product page said that there were 0 reviews, she was again thrown. I explained to her that Sustainly consolidated reviews from other websites and could be found by clicking the “Reviews” tab on the product page, she told me that she would have never pressed it. When I asked why, she said “well if there are 0 reviews, what is the point of me pressing the reviews tab?”

Fiona was also asked to find what she believed to be an energy efficient washing machine in Amazon with and without the plugin. Without the plugin, she was able to do so with a simple search. The product that she found was not energy star certified, however she seemed unfazed. When asked as to why, she said that the claims it made probably have to be taken with a grain of salt, but were probably none the less true in some regard. However, she would have been much more inclined to trust the numbers provided on a product that was energy star certified. When asked to complete the same task with the plugin, she was unable to differentiate the products from the search results page alone. When told that this page listed whether or not a product was energy star certified or not, she said she had completely missed that, having glossed over the text. She suggested that there be some sort of graphical model in place that was easily differentiable from energy star certified products and non certified products that would allow for quick and easy comparison of the results.

The final task of being able to visualize the data of products was something Fiona had little problem with, however this is to be attributed to her trials when asked to find product reviews. Fiona had accidentally stumbled upon the visualization feature at that point as so was able to easily replicate those steps when asked later on. This was more dumb luck than there being an
intuitive interface being in place. She said that had she not figured it out beforehand that she probably would have struggled with this task a lot more than she actually did.

Fiona’s said that the plugin was something that she conceptually loved. She said that this was a plugin that she truly wanted to see implemented to completion. However, with that being said, she would need the many kinks of the system to be finely smoothed out, that currently the idea was there but the design definitely needed improvement.

*James*

One source of confusion for James was the concept of our plugin adding information onto the page like the sustainly approved data and the add to analyzer button. He did not have experience with plugins that modified the page source, and he was skeptical about users wanting the plugin to do that. He advised us that if we do end up adding data directly to the webpage, we should make it very clear what information is being added. One idea we had that he approved of was to put the additional information in a box labelled “added by Sustainly.”

When trying to complete the Visualization task, James ran into some usability issues. He correctly assumed that the analyzer tab was used for visualizations, but when he tried to open the analyzer tab without first adding any products to the analyzer, it did not work. In fact, there was a bug in our interactive prototype that redirected him to an unrelated page, and that was very confusing to him. However, even without the bug, we realized we had overlooked the possibility of a user opening the analyzer tab without anything in it. Moreover, when he clicked the add to analyzer button without the analyzer tab open, he was expecting the analyzer tab to open on its own. Overall, James felt that the add to analyzer button was not intuitive, and the button distracted him while he was trying to complete other tasks.

Another concern that James had was that as a user, he would be worried that our plugin could “hack his Amazon account” or that we would just show him the products that our plugin was paid to show.

*Britney*

When tasked with using our plugin in conjunction with Amazon, Britney was confused by some of the features. Not knowing where to begin, she explored the different options in the interface. She felt that the location of the plugin is conveniently stationed at the bottom of the screen. The first thing she pointed out was the settings tab of Sustainly. It should be contained inside the expanded screens of Sustainly, so that there would be more screen space to work with.

After searching for a product, she liked Sustainly’s recommended products feature. The only issue she identified is the criteria that Sustainly evaluates a product on, and how it affected the search results.

She then tried to add a product to the Sustainly comparison screen, but did not see a clear indicator of where to accomplish this action. After several minutes of confusion she finally
located the add button near the amazon product but she did not know whether or not that was Amazon or Sustainly's feature.

[4] Sustainly prototype (as users saw it):

Fig A.1 - Empty Browser
Fig A.2 - Default Amazon.com page with empty search
Fig A.3 - Default Amazon.com page with filled search
Fig A.4 - Search result page
Fig A.5 - Product result page without plugin open
Fig A.6 - Product result page with “Energy Details” tab open
Fig A.7 - Product result page with “Reviews” tab open
Fig A.8 - Search page with one “Analyze” button pressed
Fig A.9 - Search page with two "Analyze" buttons pressed
Fig A.10 - Search page with “Analyze” tab pressed, Cost vs. Time
Fig A.11 - Search page with “Analyze” tab pressed, Annual energy use