Helping Organizations Balance Energy Efficiency with Cost Effectiveness

Abstract
Organizations seeking to decrease their environmental impacts are making strides towards implementing greener business practices, but when shopping for internal-use products they lack the technology to effectively make large-scale buying decisions based on energy conservation and projected savings. There were attempts at energy-efficient product aggregators, but none succeeded in creating a shopping portal that allows corporations to choose green products and actually quantify the impact that their buying decisions will have both on the environment and their own energy bills. To solve this problem, we propose a shopping portal focused on helping companies choose environmentally friendly products and visualizing cost-effectiveness over the lifetime of those products. The effectiveness of this solution will evaluated through surveying organizations and getting user feedback from our prototype. This software will benefit organizations that are interested in increasing their energy-efficiency but lacking information, or companies that wonder about how long it will take for their energy-efficient purchases to become cost effective.

Introduction
A survey from 2010 indicated that nearly 70% of companies have included environmentally friendly practices to their workplace [2]. These companies took the initiative to create a greener tomorrow. While their efforts are admirable, they are hampered by the lack of appropriate technology to assist them. They have no convenient way to search for environmentally friendly products and no simple method to weigh energy efficiency against cost effectiveness. To date, it has been frustrating to attempt this, relying on jumbled spreadsheets and error-prone self-calculations that often result in companies simply giving up. Corporations such as Unilever, IBM, and Frito-Lay all mentioned that they are seeking technologies to help them go green if the right product were developed [11].

Our website will allow companies to do what they have always imagined. We aim to provide our corporate consumers with the ability to immediately find and see the benefits of environmentally friendly products. They will be able to see the overall "greenness" of a product from its production onwards and see how much it saves them in the long run in key areas such as emissions or electricity usage. Prior, this technology has been only a pipe dream for corporations. After its completion, our website will contain a fully functional shopping portal tailored to the needs of environmentally aware companies. When they select a product, they will be greeted with visualizations informing them of the cost effectiveness of the product over its lifetime in comparison to others.

These features form the backbone of our web service. Their implementation is a large part of the metric we will use to determine if our service is complete. Once these features have been designed, we will survey potential users to receive feedback regarding the overall usability of our web service. These results will allow us to make modifications to the service as needed. Unlike many other web portals aimed at selling green products, ours will tailor the product selection with corporate customers in mind. Unlike individuals, corporations need to consider long-term costs of their bulk purchases. We will arm them with information that they could not previously obtain.

Background
Balancing energy conservation with energy consumption was always a concern. However, in recent decades it has become more relevant due to world governments realizing that our rampant consumption of non-renewable energy is not sustainable. As consumers become more environmentally conscious, companies are struggling to build "green" reputations. Energy-efficient shopping portals that target consumers are emerging, but none are specifically designed to help companies make energy-efficient purchasing decisions.

In 1992, the Environmental Protection Agency created an organization known as ENERGY STAR to help label and promote energy-efficient products for consumer identification. ENERGY STAR is very successful in promoting energy-efficient products, but their website is not built for mainstream consumers. To identify ENERGY STAR products on the website, consumers must download large spreadsheets based on the type of appliance they seek. Next they need to parse through these spreadsheets to find the brands they want. This process could be user-friendlier. ENERGY STAR also has calculators for calculating monetary savings over time from using different appliances, but the calculators are in the form

of excel spreadsheets and differ from product to product. Apart from the fact that a spreadsheet is not user-friendly, there are better ways to visualize data than using tables[10].

ENERGY STAR users are expected to download spreadsheets to see lists of approved products.

List Posted on February 15, 2012

Below are currently qualified ENERGY STAR models available for sale in the U.S.

Brand Name	Model Number	Load Configuration	Volume (cubic feet)	Annual Energy Use (kWh/year)
Continental	EH020CA13211210	Front Load	2.78	155
Continental	EH020CA13241210	Front Load	2.78	155
Continental	EH020PA10211220	Front Load	2.78	155
Continental	EH020PA10241220	Front Load	2.78	155
Electrolux	SU620	Front Load	2.69	97
Electrolux	SU625	Front Load	3.18	112
Electrolux	W4105H	Front Load	3.18	107
Electrolux	W4105S	Front Load	3.18	112
Electrolux	W475H	Front Load	2.46	97
Electrolux	W485S	Front Load	2.69	97
Huebsch	FTZA1***	Front Load	2.84	184
Huebsch	HFNB+	Front Load	2.84	145
Huebsch	HFNL+	Front Load	2.84	154
Huebsch	HTE*77***	Front Load	2.84	145
Huebsch	HTEL+	Front Load	2.84	154
Huebsch	HTEN+	Front Load	2.84	96
Huebsch	HTG*79***	Front Load	2.84	145
Huebsch	HTGL+	Front Load	2.84	154
Huebsch	HTGN+	Front Load	2.84	96
Huebsch	HWF*7****	Front Load	2.84	145
Huebsch	HWR*7****	Front Load	2.84	145
Huebsch	LTZA0***	Front Load	2.84	184

Sample of Excel product list from ENERGY STAR website (Only showing a few of the data columns)

The now defunct "ENERGY STAR Quantity Quotes" (ESQQ) was a past initiative of the U.S. Department of Energy aimed at the bulk purchase and the sale of ENERGY STAR products to institutions and corporations. It claimed that it was designed to make it "easy to comparison shop for energy-efficient products." ESQQ's intent overlaps with ours in many ways. Both focus on delivering environmentally friendly products to corporate customers. Each stresses simplicity in the process. However, ESQQ affords users no ability to easily determine the cost efficiency of their potential purchases. Beyond the ENERGY STAR qualification, the user is not presented with any details of how the product benefits the corporation in the long run. ESQQ acts as more of a marketplace than a wholesaler. They play the role of a middleman for the seller and purchaser, which could make the process more difficult than required[9].

A more recent player in the environmentally friendly shopping space is SourceMap.com. They produce crowd-sourced visualizations of the product supply chains for certain merchandise, including the carbon that is output during each step. This allows consumers to get a better picture of the carbon footprint of a product. Unfortunately, since these visualizations are crowd-sourced, the accuracy and level of detail seem to vary on a product-by-product basis. Additionally, this site seems to target raising consumer awareness rather than helping people make purchasing decisions. SourceMap has an API for us to integrate their data into our project. But at this point their work does not seem to be directly related to what we plan to do [7].

An e-commerce site such as BuyEnergyEfficient.org started using the environmentally friendly angle to differentiate themselves from competitors in the crowded online retail space. Most of these sites, BuyEnergyEfficient.org included, do not provide much information as to how their products are actually energy-efficient or green. They definitely do not have any visualization tools or lifetime cost estimate tools built in [1].

A newer startup in the space, GoodGuide.com, has done a lot to differentiate itself from the aforementioned e-commerce sites. Instead of focusing on selling products, GoodGuide.com is primarily a site that simply rates products based on different criteria (environmental-friendliness, etc.). Through the use of GoodGuide's Environment rating system, consumers are able to analyze products based on different aspects relating to how green said product is. It focuses on targeting consumers instead of companies, and does not stress the cost and energy tradeoffs of products. It largely disregards how price relates to the overall picture, which makes it irrelevant for companies that focus on their bottom lines [4].

B. Tomlinson, a University of California professor, published his findings prototyping a mobile application with similar intentions as GoodGuide in 2008. The application, GreenScanner, was a 2-sided system that allowed users to contribute to an online database of environmental impact reviews of products and also read these reviews via a mobile application when they were making purchasing decisions. This relates to our problem space because it is a way of helping consumers make green purchases and understand the impact that their purchases have on the environment. Unlike our solution, however, it was targeted towards general consumers and did not factor cost information into the reviews [8].

The Environmental Working Group has several "shopper's guides" focused on different consumer products like cosmetics, sunscreen, and produce. Each guide has information on a huge variety of products in the space. For example, the EWG's Cosmetics database has over 69,000 products in it. The guides also give consumers an easy interface to search products in the category and see the healthiest products. Unlike our proposed solution, their guides are consumer-centric whereas ours is company-centric. Additionally, they make it difficult to see the price and to compare products. Our solution will have visualization tools to help corporations understand and visualize the environmental impact of using one product over another. In addition it will allow simple side-by-side comparisons of products[3].

Another company that recognizes the market movement towards green products is Green Retail and Wholesale. Their shopping website, http://buygreen.com, sells green products for consumers and companies. The company examines products and ranks them on a scale of 1-100 based on four environmental criteria. They only sell products above a certain threshold, so buyers can be assured that they are getting green products. This solution is similar to ours because it is also a shopping portal that companies can use to buy green products. However, it does not help companies see the benefit when they buy environmentally friendly products. Ours is different because we show how the products can save them in long run and other benefits they could acquire [5].

Target Users

Our solution targets organizations looking to purchase goods in bulk. Procurement specialists at medium to large size environmentally conscious businesses might find our tool especially useful. These specialists would be motivated to find energy-efficient products, but they might not know where to turn to for the best advice on balancing energy-efficiency with cost effectiveness. We would help these specialists by allowing them to search for products in bulk and use data such as how much their company pays for energy to visualize graphs of the cost-effectiveness of certain products based on how long the product is used. Some energy-efficient products might never save enough money to pay for the price difference from non energy-efficient alternatives, but some might pay for the difference after only a short period of time. It would be useful if procurement specialists could have this type of information available to them when they are making decisions. Furthermore, corporations want to be able to convey a strong positive image to their potential customers. Many would like to be able to claim that they are working towards creating a cleaner environment and a better tomorrow. With our product, they would be able to do this without significant difficulties.

Scenario Walkthrough

Imagine that the owner of a successful chain of laundromats wants to replace some of his machines. If he doesn't already have a supplier in place, he will probably use the Internet to research the best commercial-grade washing machines and dryers. He might be environmentally conscious, but he would probably be more concerned with maximizing his company's profit. He might look around for sites that allow him to find the best washing machines that balance cost-effectiveness with his green intentions, and find shopping portals such as GoodGuide.com or BuyEnergyEfficient.com. He would search these sites for washing machines. He might find it difficult to use these sites since they lump all washing machines into one category, meaning that most of the washing machines he would be looking at would be meant for residential use and not prepared for the heavy use that commercial-grade washing machines go through. Because of his difficulty finding the right type of washing machine, coupled with the fact that neither of those sites allows visualizations of energy or cost savings over product lifetimes, he might decide to try ENERGY STAR. He would navigate ENERGY STAR's website to the business and organization section, and find the commercial washing machines product category. He would download the product Excel sheet and the energy savings calculator Excel sheet so that he could understand the cost-effectiveness of his new machines over their product lifetimes. If he wanted to compare different washing machines in the list, he would have to copy and paste their product information individually into the savings calculator spreadsheet.

Only then, after jumping through all these hoops is the laundromat owner able to make an informed decision about his purchase. The goal of our website is to eliminate these hoops. No longer will companies be forced to use archaic spreadsheets and limited tools to a make green choices. Instead, it will be as simple as going to our website. Immediately, users will be greeted with a clean interface in which they can choose from a number of different categories depending on their need. When a category has been navigated to, environmentally friendly products will appear along with energy facts associated with them. One or more of these products can then be selected and their energy use and cost--effectiveness over time will be graphed for the user to see. These visualizations allow for a more intuitive understanding of the products that the user is interested in. The simple design allows for the same informed decision to be made without the frustration required currently. When the company has finally narrowed down their options to the product they want, they will be linked to websites where they can buy it individually or in bulk.

Resources

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Appendix
Enabling Consumers to Choose More Environmentally-Friendly Products

According to recent surveys, 87% of consumers are interested in environmentally friendly products, but most consumers also have a lack of awareness about the differences in energy-efficiency between "green" products and their non-green alternatives [1]. I propose a product that would help consumers become more educated about energy-efficient products and also satisfy their interests in reducing their carbon footprints. There are a huge number of consumer products that are marketed as energy-efficient, or "green", but it isn't always easy for consumers that are looking to buy a product to find the choice that is most environmentally friendly. My solution would be a comparison shopping portal that allows users to input a product that they wish to buy, which could be something like a toaster oven, and compare similar products based on energy-efficiency. It would also have visualizations showing how much energy and money one could project to save by using one product compared to another. This would make it unique from any other energy-comparison shopping portals that just allow comparisons by energy usage, but don't actually help consumers understand what a difference of X kHz between products translates to. This will help confused consumers that want to help the environment by giving them an easy way to find the best products for them to use, and it could also help them save money on their energy bills.

References
1. Oppenheim, Jeremy, and Sheila Boninin. "Cultivating the Green Consumer." Stanford Social Innovation Review. Fall 2008. Web. 05 Feb. 2012.

Since the initial proposal, our project remains the same at heart with one major exception. Rather than focusing on mainstream consumers we decided to switch to corporations instead. After much deliberation, it was clear that the impact that we feel our product could make would be better suited for this virtually untouched target group. Corporations have different needs than individuals. Their decision making process is ultimately influenced by cost and they have a need for bulk quantities in many cases. Our product presents them with the information needed to make smart decisions on purchasing green products and then allows them to visualize when their investment will become cost effective.