Energy Conservation: Public to Private Sector Knowledge Exchange

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Executive Summary

This report, a product of the scholar's class CPSP249E, serves to assist Howard County's Office of Sustainability in taking further steps toward a more energy efficient county. Specifically, this report addresses how Howard County can incentivize and persuade its private sector businesses to reach higher levels of energy efficiency.

To conduct their research into this topic, students used the five-step Design Thinking Process, relying heavily on the idea of empathy to achieve the results outlined in this paper. Though students created prototypes to potentially solve the issues at hand, this report focuses more on the take-aways, tips, and methodological discoveries made during the process of creating specialized devices. This information is believed to be more valuable because these types of findings can be applied to numerous business types and a multitude of situations rather than the limited prototypes created with specific businesses in mind.

The report concludes with recommendations, based on the student research, for Howard County to consider in their future work toward sustainability.

Research Topic & Overarching Issue

Energy consumption has been on the rise in the United States in recent years, with many agencies and industries attempting to develop innovative technologies to reduce this ever-growing consumption. With the United States being one of the largest consumers of electricity and one of the largest consumers of primary energy, an even stronger push has been made to discover both more efficient ways to consume energy and more effective ways to promote cleaner sources. The goal of the University of Maryland's affiliation with Partnership for Action Learning (PALS) in this sustainability course, was to link University of Maryland students to a hands-on opportunity with Howard County. It was the hope that through this partnership, constructive research could be done on methods to increase the energy efficiency of Howard County's private sector, which in turn would decrease the County's energy consumption.

Generally, the cost and effort required to improve a building's energy efficiency can cause individuals to avoid more sustainable pathways. In an attempt to curb this lack of enthusiasm, Howard County has put forth incentive programs, in addition to the numerous programs offered by

the State of Maryland and the federal government. Currently there are an assortment of incentive programs and innovative technology available for residents and businesses all over Howard County. However, despite the availability of more energy-efficient options, most of those in Howard County fail to take advantage of these opportunities, leaving their homes and businesses lacking the energy efficiency that is the goal of Howard County's Office of Sustainability.

The students therefore began their research hoping to better understand the overarching issues that have kept Howard County businesses and sustainable options estranged. Early on, the discovery was made that an overarching issue such as sustainability in the County's private sector was going to need more than one solution. Instead research into business-type-specific issues would be required to create specialized solutions. The necessity of specialization came with the discovery that different types of businesses have different needs, aspirations, and limitations when it comes to sustainability. With this discovery, the students began to focus on ideological recommendations for the County as they continued their research and moved on to drafting solutions for specific business types found in Howard County's private sector.

Local Context & Background Information

Howard County has the potential to revolutionize sustainability in Maryland. With its Native American background, Howard County has a rich history of caring for the environment. The County's location in central Maryland's heart gives it immense power to influence surrounding counties. This power could be used to advance sustainability initiatives across the State.

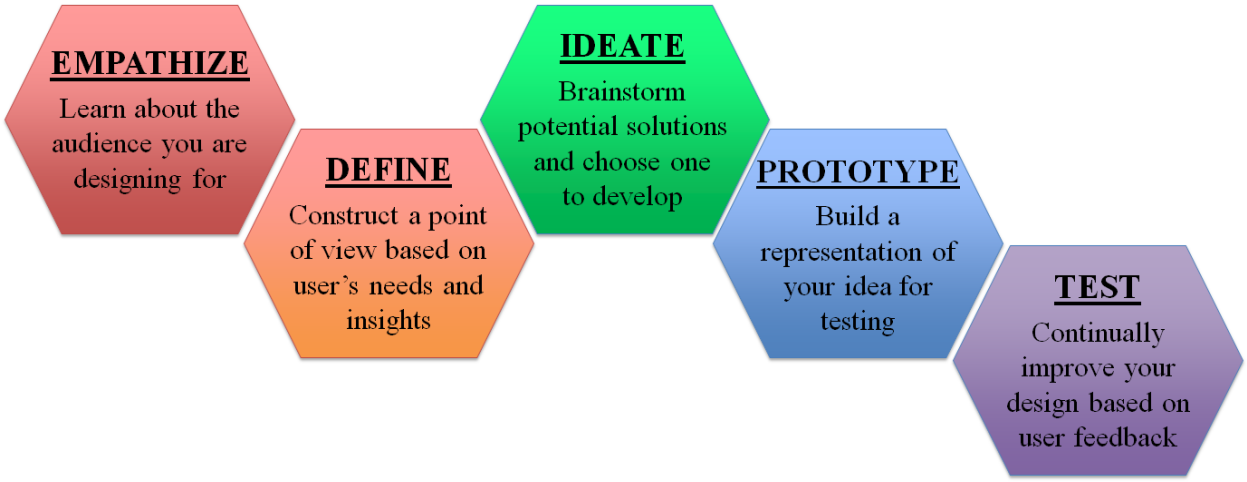
With the fifth largest and fast-growing population, Howard County holds a great deal of power for determining the future of Maryland's sustainability. The County's residents, primarily highly educated and affluent individuals, give Howard the opportunity to broaden the scope of its sustainability initiatives. The diversity of the residents also enables the County to explore the improvement of many different businesses and community amenities. These improvements, in support of Howard County Executive Allan Kittleman's intentions for the Office of Sustainability, would incorporate sustainability initiatives, focusing primarily on energy conservation.

To assist this mission of increasing the sustainability of Howard County, emphasis was placed on studying a variety of businesses to understand their relationships with their customers, in order to determine how to best incorporate energy efficiency strategies.

Research Methods

This paper's research was conducted following the five-step Design Thinking Process depicted below. The Design Thinking Process is a framework to help develop creative and effective solutions to difficult problems. Though its steps are displayed linearly, this process is circuitous; it often requires repeating previous steps in response to additional information or miscues.

This process may allow for regression and reevaluation, but it does not allow users to circumvent steps. Each project must begin in the empathizing stage and end with testing. These steps helped to guide the students as they analyzed the issues and in developing potential solutions.



The first step in the Design Thinking Process is empathy. In this step the students worked to understand the various stakeholders within Howard County's private sector and to view energy related issues from their perspectives. The empathetic stage enabled the students to collect data in an unbiased, open-minded fashion. Additionally, the basis of an exceptional research project is not only the collection of sound data, but also the strong understanding of that data. The students therefore spent a majority of their time on this first step, fostering valuable connections with stakeholders, to gain a deeper understanding of their findings, and to ensure that the following steps could be completed more effectively.

To understand the current business-customer relationship as it pertains to energy efficiency, the class performed multiple observational activities and interviews. These undertakings, though not always located within the boundaries of Howard County, were carried out in locations that were prime parallels to those found within Howard County. Visiting these locations enabled the students to gather insider information about businesses' aspirations, actions, and apathetic tendencies regarding energy efficiency. This insider information was necessary to ensure that the solutions devised later in the process would be tailored to the desires of their intended users. Thousands of hours could be spent crafting an innovative device, but unless the device was created to meet the wants and needs of its intended users, the device would fail in its integration into the public. To devise a truly successful solution, one has to be empathetic toward the stakeholders and craft a tool that the stakeholder actually wants to use.

The second step of the Design Thinking Process deals with narrowing down the problem to be solved. The task of analyzing observations made during the empathetic stage, though cumbersome and tedious is beneficial in the long-term scheme of designing. To draft a solution, a problem must first be outlined. The students found that if the problem they wished to solve was too complex, a solution may be obscure and/or lack feasibility. Therefore in this define step, the students constructed a variety of points-of-view, each iteration defining the problem in greater detail. The structured process of creating a POV helps define the target audience, as well as the audience's needs to be addressed in the solution. Using the empathetic observations made in the first step to narrow the focus to a specific need, an effective solution is easier to brainstorm in the next step.

The third step, ideate, involves brainstorming to facilitate creative thinking by removing feasibility restrictions to allow a free flow of ideas. This form of thinking is valuable to a degree. When brainstorming, any idea is a good idea, even if it is not most viable solution. In the end, the whole point of brainstorming is to spark ideas. The most impractical idea offered during a brainstorming session might happen to be the one that inspires the later chosen design. Using "how might we…" statements as a guide, the students brainstormed an array of ideas to solve the individualized problems. At the conclusion of the ideate phase, each group chose a solution to pursue in the next step.

The fourth step, prototype includes constructing a representational model for the chosen solution. The purpose of a prototype is to effectively represent a portion of the solution, (which will be tested

in the final step), to understand how the design's target audience will react to the solution. Before constructing a prototype, the designer should have in mind a question that they wish to answer through their representation. Additionally, the students determined that a prototype should be cheap, simple, and inviting to maximize its benefits. Being inexpensive and easy to assemble allows for multiple iterations of the design as improvements are discovered. A simple to understand design allows the target audience to interact with the prototype with little guidance, leading to more informative interactions. And finally, being welcoming ensures that individuals won't shy away from, or be too intimidated to handle the prototype.

The final stage of the Design Thinking Process is testing. By testing the prototype before finalizing the design and integrating it into practice, a designer takes this opportunity to discover any flaws in the design. A design's inapplicability as a solution for the POV can be exposed in this step. Realizing a design's deficiency in the early stages of testing, rather than later during the implementation phase, saves a design team valuable time and effort. A few of the student groups experienced prototype failure; these slight setbacks provided the groups with useful knowledge. Learning from ineffective designs, they returned to step three, ideation. This nonlinear path is one of the advantages of the Design Thinking Process; when a prototype fails, instead of trashing the entire project, the process enables you to step back, reanalyze empathy research, ponder newly discovered observations, and choose a new solution.

Results

The class project focused primarily on small local businesses without the financial means to completely retrofit their building to become more energy efficient. As we interviewed these businesses, we realized that many of them did not consider energy efficiency a priority. The business owners could not afford to compromise their already stretched budgets to incorporate costly energy efficient improvements.

This realization removed the plausibility of convincing these businesses to invest thousands of dollars in energy audits and retrofits. We found that businesses were interested in improving their energy efficiency, but they did not know enough about their energy use and what ways to reduce it. Our proposals focused on providing the businesses and their customers with information about energy efficiency and how they can improve theirs. With the proper resources, they should be able to make whatever changes they can to improve their efficiency.

As we studied the Design Thinking Process, the class divided into smaller teams to narrow the focus of Howard County private energy sector. The groups decided what types of businesses they would study according to their mutual interests. Each group focused on one type of business:

- Chain restaurants
- Dental clinics
- Golf courses
- Grocery stores
- Cafes and local restaurants.

Chain Restaurants

This group focused on restaurants that were part of a chain, particularly those found in shopping malls. After interviewing several of these restaurants, this group discovered that mall tenants have very little control over their energy use and pay a flat rate for electricity. Since the cost of their electricity stayed the same no matter how much they used, the chain restaurants and stores were not financially incentivized to conserve energy.

To combat this apathy over energy use, the group proposes the implementation of an online course that would inform mall store and restaurant owners and employees about their energy use and ways they can conserve energy. For example, encouraging employees to turn off appliances when not in use or to not waste food, which wastes the energy used in growing, harvesting, preparing, and transporting it. The course would also provide employees with information on technological improvements to conserve energy, for example replacing incandescent light bulbs with compact fluorescent or LED bulbs.

To motivate chain restaurants to complete this online course, the group suggests making it into a competition to see who can reduce their energy use by the largest percentage. The annual winner of the competition would receive a monetary prize or a discount on their energy bill. By doing this, participants will have an extra reason to try hard in the course, learning more in the process and finally, everyone working at the stores will get an opportunity to learn about energy efficiency.

Dental Clinics

This group narrowed their study to just dental clinics because other businesses have similar needs and layouts and dental clinics can represent the larger health industry, including businesses such as optometry and physicians' offices; they can also be analogous to larger hospitals.

The goal was to find ways to reduce the energy that dental offices consume, while not increasing the workload for the staff or hindering their ability to make a profit and maintain their customer satisfaction and comfort. After interviewing local dental clinics and going through the Design Thinking Process, the group came to understand the extent of the workers' knowledge on energy efficiency. To assist the dental clinics in learning more about energy efficiency, the group proposed building an easy-to-use website and providing consulting service to help inform dental office managers how to approach making energy efficiency upgrades. The website would inform the clinics on how they can conserve energy as well as connect them with energy efficiency experts so they can ask questions or hire them for an energy audit.

From prototyping and testing, the students learned a couple of important facts about energy efficiency in dental clinics. The first is that dental clinics would consider upgrading their energy systems if they had reliable information. This is highlighted by the fact that the stakeholders really enjoyed the "contact a professional" part of the design.

Golf Courses

After interviewing golf courses to determine their major energy sinks—the appliances that consume the most energy—the group discovered that these businesses are victims of vampire draw: energy drawn while an appliance is off but plugged in. For example, golf carts are plugged in to charge when they are not in use and so for most of the day the cart is draining energy.

In the interview, the group learned that changing the employees' behavioral practices to remember to unplug the carts as soon as they reach 100 percent, would interrupt their daily responsibilities. To meet the needs of the golf course employees, the group decided to propose a design for the golf cart charge stations. Most charge stations have multiple carts plugged in and the station sends electricity to all carts regardless of each battery's level. The prototype would use an automated system to stop the electricity to a golf cart as soon as it was completely charged. The charge station would direct control which carts are being charged. This design would eliminate electricity wasted

by charging an already charged cart, As soon as a cart is charged it will no longer receive electricity. This design will not only save energy but also save the golf course money. This prototype is still in the conceptual phase and will require more research to determine if it is a viable strategy to conserve energy.

Grocery Stores

Through several interviews with grocery stores in Howard County, this group discovered a disconnect between the businesses and financial incentive programs. Such programs, often offered by large energy providers like PEPCO and BGE, would enable businesses, like grocery stores, to pay for energy efficient retrofits. Small storeowners typically have fewer resources (especially in terms of capital) but some have the power to make energy-based decisions without any other necessary input.

To bridge the gap between local business owners and the energy incentive programs, the group proposes to create a database that can be a valuable resource tool offering financial services and connections to reliable auditors and contractors. The database will give the business owners the information they need to improve the energy efficiency of their stores. Another aspect of the database is that the store owners will make an account, allowing them to connect to other store owners to see what they have done or plan to do to improve their efficiency. This will foster an energy efficient business community, hopefully inspiring other businesses to join and take on the challenge to improve their energy efficiency. Howard County has a massive opportunity and a lot of room for growth when it comes to getting its local grocery store owners to participate in incentive programs, the proposed database would be an example of a platform that would accomplish such a task.

Cafes and Local Restaurants

This group decided to study the relationship that cafes and non-chain restaurants have with energy efficiency. After interviewing a few of the restaurants, the group discovered that owners and managers had some knowledge of energy efficiency but did not actively attempt to improve their efficiency. One manager explained that their customers had not made energy efficiency a primary concern, as they had with fresh, local food and a pleasant atmosphere. As a result, the restaurant did not consider the matter important enough to change their behavior.

This led to the group's first prototype where customers would leave little notes at the table regarding the restaurant's efficiency. This idea was scrapped when the group realized the assumption that the customers would care enough about energy efficiency to continue leaving these notes to get the owner to consider improvements was too great. The group decided to use the popularity of online review sites to get the customers to consider energy efficiency as a deciding factor in where to go out to eat. The second prototype would be a rating system, modeled after the LEED certification, to showcase a restaurant's energy efficiency. The rating would be based on several criteria like locality of produce, type of appliances, lighting, and HVAC system. This proposal assumes that major online review sites, like Yelp and Google, would partner to show these ratings. The energy efficient restaurants would voluntarily provide their data to our imagined company, Energy Efficient Eateries (EEE), so that they can have a high rating shown online. Restaurants with high ratings would benefit by the increase in their customer base. Other, not as efficient restaurants would then work to improve their energy efficiency so they too can benefit and not lose to their competitors. Users would be able to click on the rating and then see how the restaurant was scored, teaching them about energy efficiency. The rating would also be put on the storefront window.

This proposal is also applicable to other businesses besides restaurants, with the food locality criterion removed. For this proposal to be successful, a focus group of Howard County businesses should be created to see if the users react in the way we expect them to.

Analysis

The variety of projects allowed us to gain a deeper understanding of the give and take relationship Howard County businesses have with both their customers and with energy efficiency. Though Howard County already has several energy-efficient businesses that have taken advantage of ever-improving technologies, the County still has room for growth.

This potential for sustainable growth was found to be greatest in the area's small businesses. These student projects have shown that businesses are willing to become more energy efficient, but often lack the knowledge to act on their desires. In light of this, the class proposed varied methods Howard County can use to provide businesses and their consumers with greater knowledge about energy efficiency.

To determine this need and develop proposals, a great deal of the semester was spent on establishing empathy for the unique array of businesses found within Howard County. The prototypes, taking up only a small portion of the class, were examples of solutions the County might wish to look into. To determine if these conceptual proposals are even feasible and have the possibility of being successful, solutions would require more research that delve deeper into the private sector stakeholders and be adaptive to the reactions collected from prototype testing.

However, where this class is concerned, even though the stakeholders had minimal interaction with the prototypes, they were often pleased with the additional information provided on how to improve their energy efficiency. The students found that most of the businesses they observed and interviewed with were unaware of the financial assistance programs that could help them become more energy efficient. Howard County could decrease its energy consumption by providing its businesses with access to these incentive programs.

Recommendations

Provide businesses with information on energy efficiency.

It would be difficult for Howard County to enforce policies that ensure businesses evaluate their energy efficiency and work to improve it. But if the County provided the information to help them pay for energy audits and retrofit, businesses interested in becoming more energy efficient will leap at the opportunity to do so. Therefore Howard County may be able to reach its goal of becoming more energy efficient by providing businesses with information (through a website or database) on energy efficient practices, financial incentive programs, reliable contractors, and what competitors are doing to become more efficient.

Foster strong connections between businesses and their customer base.

Howard County has an array of businesses so it is easy to see how customers can have a hard time committing to a specific business or practice. But if customers were able to make those connections, they might voice their concerns or give the business suggestions on how to improve their services. A successful business prioritizes meeting its customers' wants and needs. So it is through these relationships that businesses would change if their customers considered energy efficiency to be important. Using the strong relationships between businesses and customers is one way Howard County can reduce its energy consumption. The County can foster these relationships by holding festivals to connect the customers with the businesses.

Provide the tools to allow customers to consider energy efficiency.

Howard County can use a platform that its consumers are already using to get them to learn and think about energy efficiency. The County could add a column to local newspapers or reach out to the Parent Teacher Association to teach students and residents about how local businesses are becoming energy efficient. A tool that could be enormously successful is adapting Yelp and Google reviews to include energy efficiency ratings.

Research common energy sinks for businesses.

Despite the wide variety of businesses Howard County contains, nearly all of them have the same energy sinks, appliances that use a large percentage of the electricity. For most commercial buildings, the largest sinks are lighting and HVAC systems. This would be the case for restaurants, hospitals, stores, grocery stores, banks, etc. A recommendation for Howard County would be to research what type of bulbs, what HVAC settings, and what standard practices these businesses can implement to improve their energy efficiency. After researching these topics, the information would be provided to businesses so they can adapt their practices and install the efficient technologies.

Businesses studied

- Johns Hopkins Bayview Hospital
- Columbia Association
- Busboys and Poets
- Board and Brew
- Proteus Bicycles
- Pandora's Cube
- Adidas
- Tutti Frutti
- Jumbo Jumbo
- Chipotle
- Maggie Moo's
- MOM's
- Apna Bazaar
- Giant