ECO: A Sustainability Education Chatbot

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ECO: A Sustainability Education Chatbot

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Abstract

There is a lack of access to information about sustainability from what the climate crisis is to how to recycle properly. For both sustainability-informed and uninformed individuals, learning new information about sustainability and reducing their waste in a way that compliments their lifestyle is time-consuming, requires strategic skills, and can cost them money. ECO is an audio and text-based chatbot that teaches users to be more environmentally conscious through waste reduction.

Keywords: chatbots, sustainability, anthropomorphism
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Introduction

There is a lack of access to information about sustainability from what the climate crisis is to how to recycle properly. For both sustainability-informed and uninformed individuals, learning new information about sustainability and reducing their waste in a way that compliments their lifestyle is time-consuming, requires strategic skills, and can cost them money.

ECO is an audio and text-based chatbot that teaches users to be more environmentally conscious through waste reduction. Based on location, the user can ask any sustainability question and the chatbot teaches the user to properly reduce, reuse, repair, recycle, and/or dispose of their unwanted materials in their area, as well as provide general information on a sustainability topic.

The Problem

There is a lack of access to sustainability information. The United Nations describes sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” [21]. For the purpose of this paper, sustainability refers to environmental sustainability. Sustainability information includes both local and national resources that focus on waste stream options, proper disposal of all items, environmental policy, and environmental education.

For both sustainability-informed and uninformed individuals, learning new information about sustainability and reducing their waste in a way that aligns with their needs and values is time-consuming, requires strategic skills, and can cost them money.

The problem can be seen through this pain point statement: "I want to know how to dispose of the materials and items I no longer want, but I do not have the time or money to do so."

The United States throws away almost 300 million tons of trash per year with over half going into the landfill, according to the United States Environmental Protection Agency [2]. Over 70% of the materials have the potential to be diverted out of landfills into proper waste streams, like composting, general recycling (hard plastic, paper, metal), and specialized recycling (soft plastics, glass, specific items) [2].

In addition, the United Nations has declared the climate crisis "a code red for humanity," sending warnings that there must be actions taken to protect the environment to keep it habitable [1]. People want to be a part of these efforts, but may not have the knowledge to do so.

Finally, a study across the United States and Australia indicated that 93% of participants had a “general concern for the environment”, with 83% of participants wanting to be environmentally conscious in their everyday lives [3].
Through these expert recommendations and statistics, it is evident that access to sustainability is wanted, essential, and has the ability to make a large positive impact on individuals and the planet.

**The Solution**

ECO is an audio and text-based chatbot that teaches users how to be more environmentally conscious through waste reduction. A chatbot is "an artificial entity that is designed to simulate an intelligent conversation with human partners" [4]. Based on location, the user can ask any question related to disposing materials, and the chatbot then teaches the user how to properly reduce, reuse, repair, recycle, and dispose of those unwanted materials. The application also features an environmental impact calculator and allows the user to save responses to refer to in the future.

**Features**

**Resource Recommendations**
Through any version of ECO, users can request resources from the chatbot feature of ECO. When a user requests information on how to dispose of a material, ECO is able to provide personalized responses based on the user’s sustainability knowledge, location, and more. Each recommendation can feature a link to additional information, a description on the process of disposal, and alternatives to throwing the material into any type of waste bin. Examples of this process are described in the “User Scenario” section within this report.

**Bookmark**

Through the standard or discounted subscription, users have the option to save recommendations from ECO referred to as bookmarks. Within the application, users can add, edit, or delete bookmarks. Each bookmark includes a website link for additional information and a description of the resource.

**Impact Calculator**

Through an active subscription, users have access to their environmental impact. Based on the user’s actions, ECO will calculate the pounds of waste the user diverts from the landfill per month and year. Detailed and overview visualizations is provided to users, as well as, supplemental materials to fully understand their environmental impact. For example, if users compost, they divert 30 pounds of food waste from the landfill each month [2].
Savings Calculator

Through the paid version of ECO, users will be able to see how much money they are saving on a monthly and yearly basis. Through user’s actions, ECO will calculate the amount of money saved by the sustainable actions the users make. For example, if a user starts using reusable to-go coffee cups at coffee shops, they can save $12.50 per month. Detailed and overview visualizations will be provided to users, as well as supplemental materials to fully understand their impact.

Underlying Magic

Underlying magic, or secret sauce, are the features within a product that solves the intended problem. The underlying magic often solves the intended problem in a way that others have not and serves as a differentiator from other products. For ECO, the underlying magic is the chatbot and Sustainability Research Engine.

Chatbot

ECO’s main feature is a chatbot, which responds naturally to the user’s responses and requests. The use of a chatbot to solve this problem is a major part of the underlying magic of ECO. The chatbot can answer several questions, adapt to different types of communication, and can provide users with information in a more accessible way. The interaction between the user and the chatbot is distinct from a user searching for an item on a webpage or even other traditional chatbots, like Google Home. ECO “talks” to users in a conversational way and adapts its communication based on the experience and preferences of each user.

Sustainability Research Engine

Another unique aspect of ECO is the sustainability research engine (SRE) that provides the chatbot with personalized sustainability information to the user. The SRE takes the user's request, and using the Internet, finds the answer on the World Wide Web. From there, the SRE customizes the information to account for user preferences, location, and more. Figure 1 below provides a visual representation of the interaction between the SRE, ECO, and sustainability resources.

This is distinct from popular chatbots like Google Home or Amazon Alexa because the answers are personalized to the user, rather than just finding relevant information and sharing it with the user.
User Scenarios

To better understand ECO and its possible implications, the following section provides a few examples of typical use scenarios and outcomes for using the applications.

John bought a SodaStream to reduce the amount of waste he creates from plastic and aluminum bottles with sparkling water and soda. His carbonation tank has run out, and he knows that you can trade them in for a new one at a discounted price, but he feels overwhelmed to try researching that himself. So, John asks the chatbot, who responds: "Great question! Target will take your old tank and give you a replacement for half the cost of a normal tank. All you have to do is go to their customer service station." Once John has replaced his tank and indicates that on the application, the chatbot will calculate and send the impact of that decision.

Jay uses black velvet hangers to hang their clothes. However, they accidentally stepped on one and broke it. Usually, Jay would just throw them away, but instead asks the waste reduction bot what can be done. The chatbot provides various options, but the top recommendation is for Jay to repair the hanger using super glue or black tape. The chatbot lays out the potential cost savings and environmental impact of making the repair over throwing out the broken hanger.

Connie wants to know how to compost at her home. The chatbot shares several workshops in her area, online resources, and a general description of composting. The chatbot also lays out the potential cost savings and environmental impact. Connie signs up for a workshop and shares it with the application to add to her environmental footprint.
Technology Used

To develop ECO, three main components are used. First, the application and front-end of ECO were created using React. Every feature outside of the chatbot was created on React. Botpress was used to develop and host the chatbot, and SQLite is the built-in database for Botpress. The chatbot was then embedded into React, which is hosted through Firebase. Firebase also handles user authentication when users log in, register, or sign out. The relationship between each component can be seen below in Figure 3, and the comparison between the initial design and current application can be viewed in the Appendix.

To access ECO, go to: https://eco-itin.web.app/login

Figure 2 and Figure 3 show the projected and actual technical diagrams. The projected diagram shows ECO if the sustainability research engine (SRE), which finds recommendations from the Internet and adapts them to the user’s needs, was fully developed for the application. However, for the minimal viable product (MVP) of ECO, fewer technical components were needed because the SRE was not developed, due to the scope of the project. Instead, ECO has several embedded resources that users can request to show how ECO would realistically function for a user. Due to this, only three components were needed for the MVP: web application software, chatbot development software, and database software. Through the React application users can access all features, included the embedded chatbot. The React application is hosted on Firebase, which also authenticates users, and SQLite serves as the database for all chatbot dialog.
The Consumer Market

This section focuses on the target market for ECO and serves to provide an explanation why this group is the ideal market for ECO. Specifically, this section will explain why Generation Z and Millennials are the consumer market for ECO and how their consumer habits impact the financial structure of ECO.

Potential Customers

The potential customers for ECO are those interested in or who value sustainability and include both informed sustainability members and individuals new to the area of sustainability. Additionally, Generation Z and Millennials are the dominant age groups interested in the product. For instance, “Millennials are twice as likely than Baby Boomers to say they are definitely or probably changing their habits to reduce their impact on the environment” [5]. These two age groups are what are considered to be digital natives. Digital natives are “continuously connected by technology; they think and process information differently from previous generations because they are native speakers of technology” [13]. This makes these age groups easier to seek out because they are more likely to be able to use a chatbot easily and seek
out applications that solve their needs. Both Millennials and Generation Zers have a cultural value of environmental consciousness, are technologically savvy due to their age and exposure to the digital landscape, and are most likely to seek out this application.

According to a CGS survey, 68% of their participants, regardless of gender and age, indicated that they valued sustainability [6]. This means that most people are likely to be interested in ECO, and ECO has an additional market to branch out to. Additionally, “82% of consumers say that sustainability is more top of mind now than it was before COVID-19” [14]. Furthermore, “sustainable shoppers in the U.S. are 67% more likely to be digitally engaged, which means they are used to having the products and knowledge they want right at their fingertips” [7]. This statistic sheds light on the possible customers who may want more digital sustainability-focused services.

The habits of the potential customers may differ because they are split between two varying knowledge bases. For individuals who are new to the area of sustainability are in the process of shifting their consumption habits, they are looking for ways in which their buying habits can be more sustainable and are willing to try new products more because the area is so new. The customers who are experienced in the area of sustainability have already made sustainable changes that align with their needs. These customers are likely to have subscriptions or significant purchases that are attempting to make them more sustainable. For example, in Omaha, sustainability-conscious consumers may have Hillside Solutions Composting Club Services that allows them to compost at home. This segment of consumers are also more likely to make investment based purchases of a higher quality product compared to a cheaper, lower quality product. For example, a reusable sandwich bag can cost between $10-15 per bag but can last years over a box of single-use sandwich bags, which cost between $1-5 for a pack. This shows that these consumers understand that sustainable decisions may cost more, but are willing to make that purchase for the benefit of the planet and supporting their lifestyle.

In the United States, there are 72.26 million Millennials and 67.06 million Generation Zers, totaling 139.66 million people [8]. According to a survey, “the majority of Generation Z (54 percent) state that they are willing to spend an incremental 10 percent or more on sustainable products, with 50 percent of Millennials saying the same” [16]. This statistic shows the extent to which these age groups value and are dedicated to sustainability. Furthermore, a study found that “the vast majority of Generation Z shoppers prefer to buy sustainable brands” [9]. Another source states, “in 2019, almost 60 percent of surveyed Gen Z consumers in the United States and Canada stated that they prefer purchasing environmentally sustainable products” [15]. With trends of these generations valuing sustainability, there is a large percentage of the population that may be interested in my product.

By understanding the consumer market behaviors, ECO can be adjusted to fit the needs of these specific users. Additionally, by understanding the purchasing habits of these two groups, ECO’s business plan can be adjusted to be better marketed and purchased. Furthermore, a deep
understanding of the consumer market helps to determine who should test this product for usability and other metrics.

**Usability Testing: Anthropomorphism**

**Background**

Usability within the context of application design is defined as “a measure of how well a specific user in a specific context can use a product/design to achieve a defined goal effectively, efficiently and satisfactorily” [22]. Testing usability with potential users is essential to understanding if and how a product meets the needs of users and the problem it intends to solve. Usability also allows designers to understand how different types of users may interact with the product and what errors may occur.

For the context of ECO, usability testing will focus on how anthropomorphic communication effects the usability of the chatbot feature, specifically through the initial questionnaire and requesting resources.

Anthropomorphism is defined as “an interpretation of what is not human or personal in terms of human or personal characteristics” [17]. In the area of information science and technology, a robot or software may be described as anthropomorphic when it has human-like characteristics. This may include having an avatar that visually appears as a human or a chatbot that “speaks” similar to a human.

In user experience (UX) literature, experts recommend that applications are not anthropomorphic because they can cause users to be distracted, create errors, and more [18, 19]. Designers provide the following recommendations for non-anthropomorphic chat design: disclose that the technology is not human and limit the use of pronouns [18]. However, experts believe that human-like design can be useful for applications that target children because it can make it more engaging and easier to understand [18].

A common way to test usability within applications is to use the System Usability Scale (SUS). SUS is a 10-question survey that utilizes a 5-point Likert scale from strongly agree to strongly disagree [20]. This scale was chosen because it is established and widely used in this setting and focuses directly on ease of use.

**Methodology**

This study will focus on anthropomorphic and non-anthropomorphic dialog within ECO, by comparing the usability of the two communication styles. To do this, two applications will be created and each will either contain human-like dialog or nonhuman-like dialog. The dialog is based on UX literature described previously surrounding dialog and conversational agents.
Participants will use each application and provide feedback through SUS surveys and other open-ended questions. The purpose of this study is to determine which communication dialog should be used in the MVP of ECO and add to existing anthropomorphism research.

The study will have the following structure:
1. Demographic Questions (Gender, Age, Major & Minors)
2. Complete Part One Tasks
3. SUS Survey Questions
4. Complete Part Two Tasks
5. SUS Survey Questions
6. Comparison & Overview Usability Questions

Participants will complete two tasks with the anthropomorphic chatbot and two tasks with the non-anthropomorphic chatbot. Each participant will complete Part One first and Part Two second; however, it will be determined at random which chatbot will be assigned to each session. The chatbot will be assigned at random using a random name selector. Each session includes two tasks and is listed below.

Part One Tasks:
1. Complete the Introductory Questionnaire
2. Request Information about Old Socks

Part Two Tasks:
3. Request Information about Styrofoam
4. Save the Styrofoam Recommendation

The purpose of the usability study is to determine which chatbot will be a part of the MVP of ECO and hopes that it will also contribute meaningful knowledge to existing chatbot literature.

Findings

20 participants completed the usability study. The participants ranged from 19 to 35 years of age, with the majority (35%) of participants being 22 years old. 50% of the participants identified as female, 25% as male, and 10% as non-binary. Participant majors and minors varied significantly, and for this study, they will be categorized as sustainability-focused, technology-focused, and other. 45% of the participants were categorized as other majors (nursing, criminal justice, etc.), 35% identified as technology majors (computer science, IT innovation, etc.), and 20% identified as sustainability-based majors (environmental science, biology, etc.).

SUS Results
Based on random order, 9 participants interacted with the non-anthropomorphic chatbot first, and 11 participants interacted with the anthropomorphic chatbot first. Those who used the non-human-like chatbot first averaged a lower SUS score compared to those who used the human-like chatbot first. Additionally, regardless of the order the participants interacted with the chatbots, the SUS scores were higher for Part Two compared to Part One. The results are presented in Table 1.

The SUS scores are determined by converting each response (1 - Strongly Disagree, 5 – Strongly Agree) to a new number (odd numbered questions are subtracted by 1 and even numbered questions are subtracted by 5), and these new numbers are then added together for the raw SUS score [20]. To convert to the final SUS, the raw SUS is multiplied by 2.5 [20]. Table 2 shows the average of each question’s answer on the Likert scale by type of dialog and session of the study.

Based on the results from the SUS scores, the anthropomorphic dialog is “more usable,” but the results are not significant enough to determine if either dialog should be used over another. This finding goes against current UX literature that recommends that non-anthropomorphic communication has better usability.

However, the responses to the open-ended questions are also important to factor into the final decision on which dialog should be used. The user responses to open-ended questions indicate that

<table>
<thead>
<tr>
<th>Table 1: SUS Result Comparison</th>
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</thead>
<tbody>
<tr>
<td><strong>Type &amp; Session</strong></td>
</tr>
<tr>
<td>SUS Raw</td>
</tr>
<tr>
<td>SUS Final</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Average Score of Each SUS Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Human Part One</strong></td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>I think that I would like to use this system frequently.</td>
</tr>
<tr>
<td>I found the system unnecessarily complex.</td>
</tr>
<tr>
<td>I thought the system was easy to use.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>I think that I would need the support of a technical person to be able to use this system.</td>
</tr>
<tr>
<td>I found the various functions in this system were well integrated.</td>
</tr>
<tr>
<td>I thought there was too much inconsistency in this system.</td>
</tr>
<tr>
<td>I would imagine that most people would learn to use this system very quickly.</td>
</tr>
<tr>
<td>I found the system very cumbersome to use.</td>
</tr>
<tr>
<td>I felt very confident using the system.</td>
</tr>
</tbody>
</table>

### Open-Ended Question Results

To understand if users could tell the difference between Part One and Part Two, two questions were used: “Did you notice a difference between Part One & Part Two (excluding tasks)?” and “Did you notice a difference, related to communication styles, between Part One and Part Two?” The first question was used to see if they could tell a difference without any additional framing, and among those who used the human-like chatbot first, 72% of them did not indicate a difference. For those who indicated yes, they described noticing differences in wording. After being prompted with the second question, 50% of the participants did notice a difference between communication styles. Some participants described the non-human bot as “bland,” while others preferred that it was straightforward. However, it should be noted that Part Two has much less dialog, which could be why users preferred it over Part One. One participant described the anthropomorphic bot as “more personal and less AI (artificial intelligence).”

For participants that interacted with the non-human chatbot first, 67% of participants did not indicate a general difference. Most users who did notice a difference, pointed out the difference in the amount of conversation between Part One and Part Two, noting that there was too much conversation in Part One. None of the participants referenced the communication style differences if they selected yes. However, 45% of the participants did notice a difference between communications styles when prompted. Half of these participants stated similarly and
described having a more “streamlined” conversation in Part Two; however, the other half did indicate that Part Two was more “friendly.” These responses show that only a small percentage of users noticed the communication differences, and their other comments are based on the tasks assigned, not the differences between the chatbots.

Users were also asked which chatbot they preferred. For those who interacted with the non-anthropomorphic chatbot first, most participants preferred the human-like chatbot, but some stated they preferred the non-human-like chatbot or liked them both equally. Some participants indicated that they preferred Part Two (human-like) because it was more straightforward and easier to interact with, which is more notable on the tasks the user completed, and not their preference towards a communication style.

Similarly, for the participants who used the human-like chatbot first, they preferred the human-like chatbot better. They described the chatbot as “personable” and “funny.” Those that preferred the non-human-like chatbot, often noted that they liked that it was shorter and more straightforward tasks, not the communication itself.

The following themes were found from the results of the study:
● The tasks were more significantly impacting usability, rather than the conversation styles (human-like versus non-human-like).
● The human-like communication was enjoyable but did not greatly impact the usability or satisfaction.
● Users found the application to be interesting and/or useful.

When users described differences, preferences, or issues within the study, they described the difference between tasks and the dialog alongside the tasks, rather than the communication styles. One participant said “Part Two seemed to have less unneeded dialog,” when referring to the human-like chatbot. This shows that the amount of information in Part One impacted the user more than the differences in communications styles.

For users who noticed a difference between the two chatbots, almost all of those participants labeled the chatbot as “friendly,” “funny,” “personable,” or some other positive attribute. This was a surprise based on the literature review that stated adults find this communication style to be annoying or take away from the purpose of the application.

Lastly, several participants noted either in their survey responses or during the study that ECO was a useful tool for anyone to learn about sustainability. This is very helpful information as participants ranged from both informed to uninformed in the area of sustainability. These findings help to support that ECO is solving the problem that it had been designed to solve.
Based on the feedback from the participants, ECO will have more optional text within the questionnaire that users can skip, the dialog delay may be adjusted for certain messages, and ECO will use a combination of human-like and non-human-like, since there was not a significant difference.

Limitations & Future Research

The main limitation of this study was that Part One and Part Two took very different amounts of time to complete. On average, Part One took 8 minutes to complete, but Part Two only took 4 minutes to complete. This means that the user spent much more time with one type of chatbot than the other. For future research, equal time-based tasks should be used, or an alternative way of testing anthropomorphism should be used. Future research could have users only interact with one of the chatbots but complete all four tasks, and then compare the usability between each of the chatbots, or users could complete identical tasks between each chatbot. Additionally, the sample size could be expanded to more participants or focused on a specific demographic. Still, this research can be useful to show the complexity of anthropomorphism within the growing field of chatbot technology and will be useful in the final development of ECO.

The Competition

ECO’s main competition is large chatbot companies, such as Google Home, Amazon Alexa, and Apple's Siri. These products typically offer both text and audio-based conversation with customization options and are available in several languages. While these products are not designed to answer sustainability questions, they have been designed to provide information on almost anything to users. For example, if a user asked a popular chatbot “how to compost in my area,” it would bring up a list of search results. When ECO is asked the same question, ECO provides a top recommendation and additional resources in the form of a conversation. ECO serves to ensure the user has the resources they need, rather than a website link. In addition, while popular chatbots have access to large datasets and robust algorithms that provide search results to users based on their request, it is at the expense of user privacy and only provides a list of possible answers. ECO allows users to have complete agency over their data, and ECO only uses conversational data to improve the application, if the user allows it to. Users can use the application without providing any information outside of their email, but ECO does not sell any data to third party companies. This is a distinct difference from any other major chatbot service. Using the Sustainability Research Engine, ECO is able to provide users with location specific recommendations, without compromising user agency over their data, while still being able to provide a meaningful answer.

Popular chatbots serve as a substitute for ECO by providing search engine results in a more conversational form. Popular chatbots are typically based on either the purchase of a different product or via an email sign-up. The user will not receive a conversation that includes
personalized recommendations, like with ECO, but they will more easily be able to receive sustainability resources compared to a traditional search engine.

Major chatbots have been successful in several ways. They are easy to use, easy to start, and leverage brand loyalty. First, many chatbots have a variety of ways to purchase and use the products. Google Homes and Amazon Alexas have several devices that range from $20 to over $100 per device. Furthermore, popular chatbots can be used on phones, laptops, tablets, and smart-home systems. Another success of major chatbot companies is that they are easy to start because users can use existing Gmail or Amazon accounts, or even their phones to begin. The chatbot conversations are also modeled like text messaging or phone calls which allows users to easily understand how to use the product. Lastly, users are likely familiar with one of the large chatbot companies which may make users more likely to use their product over others.

Popular chatbots still have faced challenges regarding privacy, lack of specific information, and unsustainable practices. For instance, large companies, like Amazon and Google, sell and use their customer's data for profit without transparency on who has access to the data, how the data is being used, and how safely the data is being stored. Moreover, while chatbots may provide location-specific information, it is typically provided as a search result rather than a tailored conversation for the user. Lastly, many of the major chatbots use large data sets and data storage that require a large number of resources and can impact the environment in negative ways. Their physical products may also not be created with sustainable materials. Table 3 provides a summary comparison between ECO and major virtual assistants.

<table>
<thead>
<tr>
<th></th>
<th>Easy to Start</th>
<th>Privacy</th>
<th>Tailored to Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECO</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Popular Virtual Assistants</td>
<td>✔️</td>
<td>✗️</td>
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</tbody>
</table>

Table 3: ECO & Competition Comparison
Business Model & Pricing Information

Business Model

Every company has a business model, which describes the ways in which the product or service intends to make a profit. ECO utilizes a freemium and company sponsorship business model.

Freemium

The Freemium business model includes having a free version of a product that may include advertisements or limited functionality, and a paid version of the product which may include additional features and no advertisements [12].

Users will have unlimited access to the application for free, but the application will include advertisements. Free users will be able to ask unlimited questions to ECO and receive the same quality and quantity of recommendations and education as paid users. Free users will also be able to provide their own resources. However, free users will not have access to supplemental features, including the saving function and cost calculations.

The paid version will allow users to experience ECO advertisement free and will have access to all features of the application, including bookmarks, impact calculator, and cost calculator.

The Freemium business model is the best option for ECO because it allows for all people to have access to the application, but also provides those with disposable income with a more robust application. Furthermore, the freemium model features three tiers: free, discounted, and standard edition. The discounted price is for students, veterans, teachers, and other groups of people, which is typically offered with other freemium models, like Spotify and Hulu.

Company Sponsorship

Another aspect of ECO's business model is company sponsorships. This aspect of the business model allows companies to pay to have their company featured within the application. For instance, if the user asks a question about a topic relevant to a company, that company will be prioritized and may include more specialized information compared to a recommendation that does not include a sponsorship.

This aspect of the business model helps to support the number of customers that utilize the free version of the application. This will provide additional income for the company, as well as, provide more specialized information to the customer about local businesses.
Pricing

According to Nielsen, a data and market measurement firm, the sustainability market will make $150 billion in sales compared to $128 billion in 2018 [1]. Furthermore, according to a CGS survey, "Generation Z is willing to pay 50%-100% more [for sustainable products] compared with other age groups" [6]. Based on the wide variety of possible customers, some may not be willing to pay at all, so that is why the freemium and company sponsorship model will be used for ECO. However, there will still be some customers who will be willing to pay for no ads and better features. Based on this, ECO will also provide two paid subscriptions to reflect the needs of the consumer market.

Users will be able to purchase either monthly or yearly. The monthly fee would reflect similar services, such as a compost club membership and a one-time purchase of a chatbot. For instance, Hillside Solutions' discounted rate for their Compost Club members is $5 per month or $60 per year [3]. This is comparable to Amazon's Echo Dot 4 that costs $50 [4]. For Hillside Solution’s standard Compost Club membership, it is $8.99 per month or $100 per year, which is comparable to the Amazon Echo Show 8 for $100 [3, 5]. These comparisons show that potential customers spend these rates on similar products or service areas, which means they may be likely to pay for ECO at similar rates.

Discounted subscriptions will be used to reach a wider market because students and similar groups may not have the resources to afford the full subscriptions. Hillside Solutions offers this as well, which also allows them more opportunities to connect with local community partners, like the University of Nebraska at Omaha. ECO hopes to do the same with this additional discounted subscription option.

ECO’s freemium model will be priced by the following:

- Free Subscription - Free
  - Contains advertisements & restricts features
- Discounted Subscription - $5 per month ($60 per year)
  - No advertisements & no feature restrictions
  - Available for Students, Veterans, Teachers, and other specific groups
- Standard Subscription - $8.99 per month ($100 per year)

Marketing

ECO's marketing strategy leverages both social media and company partnerships with a focus on Word-of-Mouth marketing.

An article from the Journal of Interactive Marketing describes that "it is well accepted that electronic word of mouth (eWOM) significantly affects consumer's decision-making" [9].
Furthermore, the article shares that "consumers seek eWOM not only during the evaluation stage of the decision-making process, but also when there is not even a recognized need for a product" [9].

Social Media

Based on ECO's target market being Generation Z and Millennials, social media will be a core part of the marketing strategy. According to a Forbes article, "97% of Generation Z consumers say they now use social media as their top source of shopping inspiration" [10]. Furthermore, "72% of Millennials report buying fashion and beauty products based on Instagram posts" in 2017, and this number is likely to have increased since then [11]. The main social media platforms that will be used are Instagram, Twitter, Facebook, and Tik Tok.

Within social media marketing, ECO will also partner with influencers to share the product. There are many sustainability and environmental activist influencers, who partner with companies that align with their values on a variety of platforms. ECO is no exception to this and will pay influencers to post and share ECO with their followers. ECO will work with both large influencers, as well as, micro-influencers because of the various impacts these groups have on purchasing power. Some potential influencers ECO would seek out are Intersectional Environmentalism (national environmentalist influencer group) and Pumulo K. Nguyen (Omaha sustainability influencer). These two specific influencers allow ECO to reach a wide range of possible customers from the Omaha Metropolitan area to globally. These influencers have audiences in the thousands to hundred thousands. In addition, these two specific influencers only sponsor products if they actually believe in them, making their audiences more likely to purchase based on their recommendations. Other influencers would also need to meet the criteria of sustainability-conscious, specific location-based market, and believe in ECO.

Partnerships

Company partnerships will also be utilized to market ECO. ECO will work with local businesses, non-profits, universities, and other organizations to spread the word about the product.

In the Omaha Metropolitan area, ECO would like to partner with, but is not limited to, Hillside Solutions, First Star Fiber, the University of Nebraska at Omaha (UNO), Creighton University, and Omaha Green Coalition.

Hillside Solutions is a local composting company in Omaha, Nebraska. Hillside Solutions is an ideal partnership for several reasons. First, Hillside Solutions has a significant community connection in Omaha. They have partnered with concerts to create zero-waste events and go into the community to teach how to be sustainable through composting and other waste streams. In addition, Brent Crampton, the Director of Partnerships at Hillside Solutions, serves on ECO’s Board of Advisors. As a company focused on sustainability and with a deep connection to the
community, it seems like a natural fit for parenting with ECO. In addition, a partnership with Hillside Solutions may provide an opportunity to create a new subscription category. Similar to how Spotify offers a combined subscription with Hulu and Showtime, ECO and Hillside Solutions could provide a bundled subscription to expand reach and sales of both companies.

Another impactful partnership is with local universities, like UNO and Creighton University. Each of these universities have a passionate, dedicated office of sustainability looking to provide students with sustainability opportunities. ECO’s founder is an active employee of UNO’s Office of Sustainability and one of ECO’s Board of Advisors is the Director of the Office of Sustainability at UNO making a partnership highly possible. This partnership would allow for marketing to students, who have access to the discounted rate. Additionally, initiatives at the university level could use ECO to provide supplemental education that they may not have the capacity to provide. For instance, UNO just rolled out composting for housing students, and while students were trained, there is not a reliable, accessible resource for students to access outside of the UNO or Hillside Solutions website. If partnership was made, students would have access to 24/7 personalized responses. Furthermore, universities could also add recommendations, like their events and their initiatives, like composting on campus.

**Timeline**

ECO has been created and developed over several months. The table below describes each major milestone of development, as well as the usability testing.

<table>
<thead>
<tr>
<th>Project Phase</th>
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<tr>
<td>Product Ideation</td>
<td>September 2021 - October 2021</td>
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<tr>
<td>Product Design</td>
<td>October 2021 - December 2021</td>
</tr>
<tr>
<td>Product Building</td>
<td>January 2022 - May 2022</td>
</tr>
<tr>
<td>Usability Testing</td>
<td>April 2022 - May 2022</td>
</tr>
<tr>
<td>Minimally Viable Product</td>
<td>May 2022</td>
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Appendix

Mock Up Screenshots

This is ECO, your sustainability chatbot. ECO serves to answer any questions you have about sustainability and waste reduction.

The goal of ECO is to help make sustainability as easy as possible to integrate into your life, regardless of your experience, time, and anything else that would be a barrier.

Before having access to ECO's sustainability resources, you will complete a questionnaire that will personalize future sustainability recommendations.

This questionnaire is only four questions and will focus on your preferences towards privacy, sustainability, and virtual assistants.

Are you ready to begin?

Please use the buttons, or use the keywords "yes" or "no."
Final Screenshots
Bookmarks

Here is where all of your saved resources are stored. Feel free to edit, delete, or update resources.

Impact

Answer these simple questions to understand your potential savings and environmental impact!

- Do you Recycle Plastics?
  - Yes
  - No

- Do you Recycle Aluminum Cans?
  - Yes
  - No

- Do you Recycle Paper Products?
  - Yes
  - No

- Do you Recycle Glass?
  - Yes
  - No

- Do you use Recycled Bags?
  - Yes
  - No

- Do you use Compost?
  - Yes
  - No

Environmental Impact

0 lbs of diverted waste per month

Total Savings

$0 per month

Settings

Personal Details

email

password

Personalization and Privacy

You are able to update these at anytime.

- Location Services
- Sustainability Orientation
- Chatbot Orientation
Use Case Diagram
Budget

The table below provides a 5-year projection for profit. The table also includes all costs associated with the product.

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References


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