Gloset Application:

A solution to unsustainable consumerism in fashion.

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Climate change continues to be a pressing issue today and unsustainable consumption is one of the main contributors to greenhouse gas emissions. Since the younger generation is more harmonious with the fashion industry, this project aims to create an application that helps streamline eco-friendly goods to become more accessible to these users. A series of articles were collected and analyzed to determine how the type of demographic is our ideal target and the types of tools individuals use in an attempt to reduce their carbon footprint or keep themselves informed. As our primary research, we conducted a Thinking Aloud experiment for a usability test in order to determine how users navigate our interface and the issues that may arise from its original design. We found that there has been a rise in consumerism over the years due to fast fashion and women aged 35 and under are the biggest demographic for fast fashion retailers. On top of this, creating personalized content is an effective way of keeping users engaged with applications. Our report allows the general public and other designers to understand how modern technology, specifically application design, can be used to cater to pressing global issues such as climate change.

1 INTRODUCTION

Climate action has been a prevailing issue globally as communities experience climate changes like high temperatures, rising sea levels, shifting rainfall patterns, and extreme weather events. Such changes contribute to additional stress on society and the environment. Moreso, in recent decades with the increase of consumerism, compounded by globalization, and the cheap outsourcing of labor, there's a growing concern over consumer habits. Especially in the fashion industry due to the rate at which garments are being consumed and disposed of and stored in landfill sites. Globally, the fashion industry has been recorded to emit 1.2 billion tonnes of CO2 equivalent [4]. The World Economic Forum reported fashion and its supply chain as the third-largest sources of greenhouse gas emissions in 2021, accounting for 10% of global emissions annually [12]. Hence, the fashion industry has received a lot of backlash for their unsustainable practices at each stage of the supply chain and post-consumer process; human rights, consumer habits, the rate at which garments are disposed of in landfills, and increased water pollution. This is especially due to the rise of fast fashion where clothing is made fast and at a low cost to follow the current trends of the more luxurious brand, encouraging disability amongst consumers [6]. And as all companies operate with the singular goal of creating profit, they begin to practice unethical and unsustainable methods of production just to stay on top and generate the most profit. As consumers, we feed into these companies due to factors such as cost and lack of knowledge regarding unethical labor and environmental practices. Therefore, sustainable consumption is presented as a major struggle for many consumers who seek affordable goods and generally have a lack of knowledge of unethical labor and the overarching effect of supporting fast fashion companies.

Acknowledging all the issues prevailing unsustainable consumption in the fashion industry, we aim to ask and answer the following question:

> *How can modernized apps integrate behavioral change techniques (BCT) to create a circular economy and encourage the younger generation to live sustainably to reduce greenhouse gas (GHG) emissions?*

This enables us to comprehend how we might encourage sustainable consumption in order to investigate its positive influence on climate change. Companies frequently take steps to embrace sustainable practices; yet, the items are often disregarded by customers due to an oversaturated market filled with inexpensive unsustainable alternatives. Furthermore, with the understanding that collective action is likely the best approach to addressing the issue of sustainable consumption, we look first toward the consumer in terms of the reasons that impede them from consuming sustainably and the lack of existing motivational drivers. According to current research, sustainability is not a behavioral standard due to personal values and societal norms, since it is typically not in an individual's domain of conscious thought and conduct, although many people indicate a desire to engage in a sustainable activity [7]. Additionally, when attempting to understand how to encourage sustainable behavior, an individual's surroundings should be taken into consideration in terms of educational opportunities, government/business participation, and sustainable experiences. Currently, consumers are unable to buy sustainably due to issues such as being dubious of certain promises, a lack of quality or usefulness, a lack of availability, and financial restrictions.

Therefore, as a solution, we propose a mobile application called Gloset. A green trendy wardrobe streamlined to allow consumers to have better access to sustainable clothing goods through the means of reward systems, a database for providing locations for sustainable fashion goods, and environmental-related current events with concern to brands. To refine the idea, we designed an application prototype and conducted a Think Aloud protocol amongst students to understand how it could be improved through the enhancement of design or reiterating how behavioral techniques are incorporated.

This paper further examines types of methods to work around these obstacles and provide a solution to motivate users through the use of technology. We further seek to provide incentives within our solution to help consumers practice sustainable consumption; highlighting the positive impact an individual will have as a consumer on climate change. From a grander standpoint, we hope that this project helps further inform the general public about climate action and provides an example of how younger audiences engage with pressing global issues in terms

of using accessible, modern technology. Moreso, we aim to build upon the knowledge of incorporating behavioral techniques within technology for social causes.

2 RELATED WORK

To begin our research, we identified four main categories: the impact of fast fashion on the environment, the challenges associated with living sustainably, factors that motivate consumer behaviors, and the use of technology to advance sustainable living. Dividing the topic like so allowed us to address why our research question is important, current work on this subject, challenges that still need to be addressed, and appropriate techniques to solve them. Additionally, while researching we ensured an equivalent amount of primary and secondary resources. This is because, while primary sources provide trustworthy information, secondary sources help us comprehend how our research topic or suggested answer links to previous research. Moreso, each member individually reviewed 5–6 sources to identify keywords, main ideas, and recurring themes. To synthesize our data, we explored several databases including Wiley Online Library, Science Direct, and Taylor & Francis Online, among several others.

2.1 PROBLEM SPACE

One of the biggest factors influencing climate change is the fast fashion industry and its overproduction of clothing in both unethical and environmentally destructive ways. Fast fashion is a term used to describe the rapid production of inexpensive, readily available clothing that replicates catwalk designs. Fashion brands are producing almost twice the amount of products when compared to the year 2000 [9]. Industrialization has caused a striking increase in production, supplemented by globalization has led to the mass production of cheap clothing, at an unprecedented rate. 100 billion new garments are made every year globally, of which 92 million tonnes end up in landfills [9].

Not only is waste an issue, but the manufacturing of textiles requires large quantities of water, oil, land, and energy use. Polyester, which is now the most commonly used fiber in the world, is typically produced from petroleum, a carbon-intensive, non-biodegradable source [2]. Polyester never truly breaks down, meaning once it's disposed of in landfills, it remains for several decades. Although polyester production has a lower environmental impact compared to natural fibers like cotton, in terms of water and land use, it requires a significant amount of energy to create.

2.2 CHALLENGES LIVING SUSTAINABLY

A deficit model that aims to enhance environmental grasp assuming that it will make an individual more environmentally friendly, ignores two crucial factors that influence long-term environmental choices; personal values and social norms [1]. The study, "Barriers to sustainability in mature-age adult learners: working toward identity change," conducts a research study among 14 mature adults in their undergraduate studies of differing backgrounds, to identify personal values and social norms [1]. The authors discovered that the barriers can be divided into two categories:

The first being personal relevance, including inconvenience, lack of immediacy, financial constraints, and time constraints. Sustainability as a behavioral norm wasn't in the participants' cognitive frame of reference, but rather outside the realm of conscious thinking and behavior [1]. While the participants expressed a desire to engage in sustainable behavior, neither of them was self-described as already being involved [1].

The second factor was the social-environmental context which included educational opportunities, lack of government/business involvement, and early sustainable experiences. While these are not personal to an individual, they are external factors that influence their lifestyle. Removing them can allow easy behavioral change among the personal factors previously identified. That said, a solution the authors propose is a "culture of sustainability" that involves sharing pro-environment beliefs and values [1].

2.3   CONSUMER BEHAVIOR MOTIVATIONS

A study that rated existing smartphone apps that tracked individual transportation and dietary-related behaviors, highlighted how applications can be used to aid in environmental consciousness. Amongst the environmentally-focused apps, they were rating, they found features involving "personalization", "self-monitoring", and "peer influence/social networking" to be the most common and promising ways of altering attitudes [10]. The long and short-term benefits of these applications are still unclear, However, a deeper understanding of the mechanisms used in applications can increase the effectiveness of apps in changing behavior [11].

Additionally, there are many social factors that contribute to an individual's attitudes toward the environment. In an article examining the motivational drivers towards consumerism, they stated, ". . . that trusting and awareness of eco-label exert a notable influence on consumers' green purchase intention" [3]. In other words, companies have put out more eco-friendly products in order to appeal to consumers. The study also stated the following in terms of individuals with higher education levels: ". . . individuals with higher education level (ie. university or college degrees), appear to have greater green purchase intentions than less educated consumers." [3]. Meaning individuals that are well informed about environmental issues are more likely to buy eco-friendly products that are deemed trustworthy.

2.1   USE OF TECHNOLOGY TO ADVANCE SUSTAINABLE LIVING

Brands such as ThredUp, aim to inspire consumers to think second hand first by modernizing the thrifting experience. Instead of a physical retail store, ThredUp acts as an online thrifting boutique where users can get high-end second-hand items delivered to their doorstep. Other applications such as Depop have a similar mission to build a fashion ecosystem that is regenerative and less wasteful. Depop promotes circular fashion by allowing users to buy and sell their used clothing around the world.

Gamification has proven useful in educating and "promoting pro-environmental" behaviors [5]. Sustainable apps such as "enCOMPASS", "Apolis Planeta", and "Reduce your Juice" incentivizes users to reduce their energy consumption "[leading] to long-term reductions in household energy usage" [5]. What makes these apps so effective are the gamified features that allow for one to report goals, and track progress, and a form for social comparison. It provides users an engaging way to build their way to an end goal. In addition, the social comparison features boost friendly competition as well as aiming towards the same goal as a friend. One of the games, however, "Energy Cat" was not very effective in getting user engagement in energy-saving practices. The feedback stated the game did not have clear instructions, childish features, and was not engaging. Whether successful or not, these mobile apps ignite the conversation of sustainable living and motivate users to take action.

3. METHODOLOGY

Our goal with our milestones is to provide consumers of fast fashion and beauty products with a database to find the most sustainable options. Our product aims to help its users locate the nearest eco-friendly stores, update them on the impact fashion companies have on our climate and overall provide information so they can hopefully make more sustainable decisions. Not only that, but we place a heavy emphasis on creating a circular economy and provide ways for users to buy, sell or rent out their previously used clothes. While the fashion industry is oversaturated with companies that provide false ideas about their sustainability efforts, we will provide transparency to the consumer in what goes on behind the scenes. In order to build the most efficient and effective app, we conducted multiple studies to gain the necessary information.

Conducting a stakeholder analysis allows us to address conflicts and issues through the beginning stages. It enables us to plan out the appropriate level of communication with stakeholders and how relevant their influence is to this project. We believe this is one of the best ways to obtain valuable input and resources from different perspectives.

First, we need to identify who our stakeholders are, which will encompass individuals such as our targeted users, students, social media managers, etc. Our list will then be categorized and prioritized using a power/interest grid to determine our most important stakeholders.

Moving on, to record and collect data we use our personal computers to communicate with selective stakeholders via email or communication software (eg. Zoom and Microsoft Teams). We may also need to build personal profiles of each stakeholder type by laying them out in a chart providing information we gathered in the following categories (subject to change): power/interest, anticipated involvement, anticipated issues, motivation/drivers, and method of contact. This information will assist with managing them later on and will likely be facilitated through office programs that are shareable with our team members such as Google Docs, Google Sheets, or Microsoft appliances. Any other information deemed necessary will be written in personal notes; later shared and discussed with the rest of the group to determine how to proceed further. We expect qualitative forms of data that allow us to give an in-depth description of the types of motivations and the priorities our stakeholders hold.

In terms of the limitations of this method, it's possible that the information we obtain may be very niche as we are observing a select amount of individuals rather than a large group. That said, we believe through conducting surveys and interviews alongside this method, we can gain different types of information and perspectives from the individuals involved.

Another method we considered was the structured user interview. First, we would need to reach out to individuals who are comfortable being questioned and ask them more in-depth questions about their goals, struggles, and overall experience of sustainability. From there, we would conduct user interviews to get a better sense of user values, needs, pain points, and desires when it comes to gaining access and shopping for sustainable products. Doing so gives our team a better understanding of their struggles and allows us to empathize with our users.

Our team will contact the students that make up our target demographic, in an effort to attract participation. In addition to finding ways to make sustainable solutions more accessible, our goal is to inspire individuals to adopt or continue current eco-friendly behaviors. Early environmental changes pave the way for subsequent generations to follow in their footsteps, thus making the same alterations. Additionally, we observed that our chosen age range is when people begin to live independently, making it an ideal time to incorporate more environmentally friendly practices into their daily routine. Finally, in order to spend more time with each subject and obtain a better understanding, we intend to concentrate on a fewer number of interviews.

The interviews will be conducted in person or online depending on the situation of the interviewee. We will be using our computers to store questions and answers, as well as our smartphones to record interview sessions as a backup. If the interview is remote, we will use communication platforms including Discord or Google Meets as they allow for multiple people to be on call at once. We will mostly be asking open-ended questions to get as much detail from the participant as possible.

The data will then be examined by determining the objectives and frustrations. We will concentrate on elements like sustainable living challenges and barriers. By comprehending the driving forces behind our consumers, we can use that knowledge to improve our software. Additionally, since we'll be speaking with a variety of people, we can spot trends in their responses and determine the variables that influence people differently depending on the situation.

The drawbacks of this approach include the fact that we won't be able to notice all the problems that affect our target age group because we won't be interviewing a bigger number of people. If the people who were willing to participate in an interview do not feel this, we can unintentionally leave out goals and pain points that the majority experience.

Our third method, heuristic evaluation, identifies our app's common usability issues and improves user satisfaction. Heuristics act as a general rule of thumb or guidelines to inform and analyze design work. Through this, we will compare our app's interface against already accepted usability principles. By assigning the correct heuristics,

it will give us the best corrective measures to improve our app quickly and efficiently. In terms of limitations, finding what heuristics to apply, requires a deep understanding of UX design and multiple evaluators. Since it's challenging to find usability issues with just one person, all 5 of us will conduct it. Jakob Neilson recommends having at least 3 to 5 evaluators of different skill sets to uncover the usability issues. Having multiple people involved will provide different perspectives on an interface, making it easier to identify problem areas. Each evaluator will perform the heuristic evaluation on their own, and only at the end will evaluators be allowed to communicate with one another to aggregate their findings. The results will be recorded either through a detailed written report or by evaluators verbalizing their thought processes with an observer as they interact with the app.

Another limitation of this method is that it is based on perceived notions of what is "good" or "bad" usability. Although there has been a lot of research on this topic, heuristics are only guidelines and shouldn't be used in place of user testing. Fortunately, we will also be doing usability studies where actual people will engage with our application.

Finally, we will evaluate the usability of our program to better understand how people might interact with it. We're seeking a method that enables us to understand user experience, including the user's perspective, any mistakes or faults they might make, their thoughts or impressions, as well as any aches and benefits as they complete their duties. By doing so, we'll improve the functionality and design of our application before its released. In light of this, we decided to use the "Think Aloud" usability strategy. We will record the necessary information using the next approach, which is inexpensive and simple to use.

Considering the fact that our application is targeted toward the young generation, we will seek to recruit 5-10 participants aged, particularly women ages 16 to 30. We must consider their background, finances, and lifestyle to understand their pains and gains. Furthermore, we will also seek to select participants from various backgrounds in the hope to understand any cultural barriers or accessibility issues that users might experience while using our application.

Each group member will conduct an evaluation test either in person in a study room or online. We will be able to remove bias while evaluating data that summarizes three test phases: prior to the test (predictions), during the exam (pains, gains, what images are available, questions, clarifications, responses, and emotions), and following the test (summary, reflection, feedback, and connections to existing products or services). Members will be able to record the data using a template that will be created. A Figma prototype will also be needed for the test itself. To more thoroughly examine user emotions and actions, we also aim to capture the test (screen recording and user video).

The following restrictions must be taken into account: users may have trouble articulating their emotions, and it may be challenging to utilize the application and chat at the same time. They could also have trouble thinking aloud or omitting crucial details and ideas. To get over these limitations, we try to give our participants enough time to consider the facts in front of them while also asking them any questions required to continue the dialogue and comprehend their feelings. We'll also make an effort to communicate with them about any topics about which we could lack sufficient knowledge or urge them to redo specific jobs.

4 Pilot Study

After finalizing our research question and identifying the issue we wanted to address using our related research and interviews, we had come up with a proposed solution, Gloset, a mobile application promoting a green yet trendy wardrobe.

The vision for this application was to develop a cohesive database that guides and helps individuals in shopping sustainably for clothes, makeup, and accessories. The fashion industry is oversaturated with companies that provide misleading information about their sustainability efforts. Our goal is to bring more transparency into what happens behind the scenes in the garment manufacturing process, allowing consumers to make more informed judgments and make smarter purchases overall.

The application will allow users to "Shop New" where mainstream and small-business-owned sustainable brands will be identified, excluding fast fashion companies. Here users will be presented with brands' social

responsibility acts and ranks while allowing them to shop online or locate the nearest stories. Furthermore, users will have an option to thrift, rent, sell, donate, and prolong their clothing life, they will have tailoring options. All these options are curated with the thought to create a one-stop shop where individuals can shop sustainably or purchase pre-loved items in an accessible and affordable manner. Moreso, we will have features like reward systems, and current events to stay updated on fashion brands and associated laws to make sustainable, and informed decisions and analytics illustrating your impact on the environment as you shop sustainably. All these features are curated by keeping behavioral change techniques in mind as shown in *Table 1*.

Table 1: Behavioural Change Techniques and designated Features for Gloset

BCTS	Gloset Features Feature
Problem Solving	Search engine that allows users to search for their needs.
Action Planning / Instruction on how to perform a behavior	Maps, How-To tutorials in Info section
Discrepancy between current Behavior and Goal	Using mobile application and web browser extension to analyze sustainable vs non sustainable purchases in regards to fashion
Feedback on Outcome of the Behaviour / Information about social and environmental consequences /	Identifies users' positive impact on reducing water pollution, waste and CO_2 emissions.
Incentives / Signaling Rewards	Reward system; if someone purchases an item made from a biodegradable source they will earn points in which they can use to redeem discounts or coupons.
Exposure	Latest articles and information regarding fast fashion and its influence on climate change.
Identity: Identification of self as role model / valued self-identity / Identity associated with changed behavior	Sharing positive impact made on the community with friends and family through social media
Other (Entertainment)	"Pick a Look" feature will be included where outfits and makeup products will be categorized by themes, such as "going out", "work", "b-day weekend", for ease of use.

Using the application's vision and prior information, our team created a medium-fidelity prototype for Gloset. It can be viewed *here*. Having a working prototype was crucial for our think-aloud usability test as it allowed us to comprehend user experience, including the user's way of thinking, any errors or bugs they may encounter, their opinions or impressions, as well as pains and gains as they go about completing their tasks. While doing so, we were able to identify if the application will serve its purpose of promoting sustainable behavior. Once the information was obtained, it enabled us to spot misunderstandings in design components and the goal of the app itself, allowing us to restructure the structure and flow of our app.
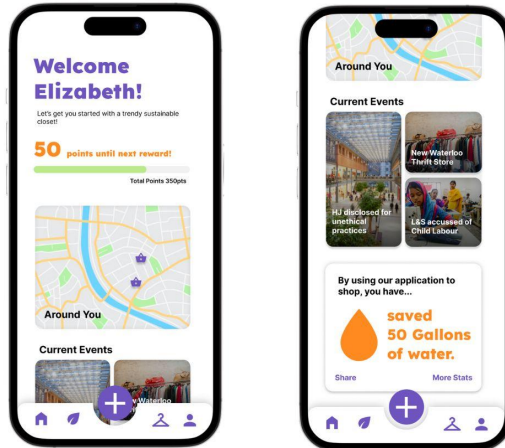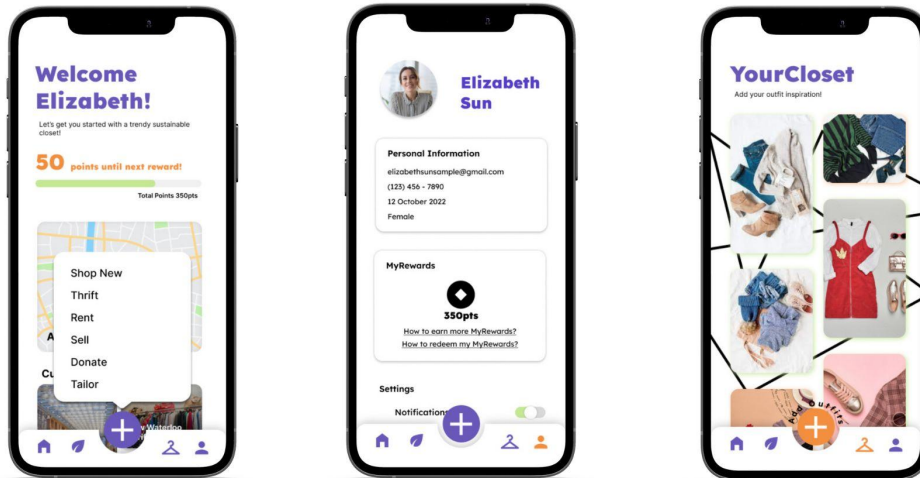
Figure 1: Gloset Prototype Screens

Figure 2: Gloset Prototype Screens

To conduct the study itself, we gathered five participants. This decision was based on Nielsen Norman's suggestion of testing no more than 5 people as she suggests running multiple usability tests with multiple small groups rather than one elaborate study [8]. This is because the more users added the less effective the feedback becomes as the majority of usability issues are found through the first few user interactions. Furthermore, we conducted each test in a separate room as all members participated in the process. Having all members participate in the study eliminated bias while analyzing data that summarizes three stages of the test: before the test (our predictions), during the test (pains, gains, what visuals are available, questions, clarifications, responses, and emotions), and after the test (summary, reflection, feedback, and connections to existing products or services). Moreso, each member used the same template to ensure cohesive data was recorded. Hence, the test itself required a laptop to run the Figma prototype, a template to record data, and a voice recorder so we could reflect upon the study. Each participant was ensured anonymity and consent to resign from the study at any point. While doing so, we asked for their consent to record data (taking notes or voice recording) and approach them at a later date after the study was completed.

Certain limitations we had to overcome during the study were that some participants struggled with expressing their emotions. It was unnatural for them to comment on what they thought and feel at every step of the way when using a product. Hence, to overcome this issue, we showed our participants a sample of the think-aloud

protocol and during the session, we asked them any funny questions necessary to keep the conversation going and understand their emotions.

5   RESULTS

Table 2: Think Aloud Study - Participant Data

Participant Data					
	Participant 1	**Participant 2**	**Participant 3**	**Participant 4**	**Participant 5**
Sex	Female	Male	Female	Male	Female
Age	18	20	21	20	23
Education	Undergraduate student	Undergraduate student	Undergraduate student	Undergraduate student	Undergraduate student
Household income	$50,000 - $100,000	$50,000 - $100,000	$100,000 - $200,000	$100,000 - $200,000	$100,000 - $200,000
Spending habits (rated on a scale of 1-10, 1 meaning very poor spending habits and 10 meaning very good spending habits)	3/10	5/10	2/10	3/10	5/10
How often do you buy new clothes?	Once every two weeks	A couple times a year	Once a week	Once a month	Once a month
What	Mostly social	Discounts like on	Ads, social media,	Influencers	Big sales and social

influences you to make purchases?	media influencers (Tik Tok, instagram, youtube hauls, etc)	Black friday or Back to School	wanting to keep up with trends		media influencers

Thinking Aloud Chart

Participant Age: 20
Sex: Male
Education: Undergraduate
Occupation: Student

Overall Feeling:

☺ 😐 ☹

Before		**Predict** I predict... I think _____ will happen	• be introduced to shops that are sustainable and ethical • advocate what shops are sustainable and what are not • educate users regarding why it is crucial to shop sustainable • visually appealing application to attract more audience
	During	**Picture** I can see... I can picture..	• tips, current news, impact • modern and bold design that is yet sleek • "i can picture one being confused about the nav bar and some features. I would want a tutorial"

		Question
		Why did..?
		What does _____ mean?
		How do I...?
			• When first interacting with the home screen:
			  ○ how do I know how I can earn rewards?
			  ○ how do I redeem them?

		Clarify I am confused about... I didn't expect....	• Why are settings and privacy policy under user profile • What would it look like once you "Shop New" and various shops pop up? ○ What information will users be provided that motivates them to shop
		Respond I think/feel... I agree/disagree...	• why is there a tip on the first page. ○ "It is my first time opening the app and I am already introduced to a tip...better if I was a returning consumer" • I like how well organized the visual design is. Makes it easy to follow. • I like the current news
	After	**Summarize** What it's saying is... The point is...	• I think the application is a hub for people who want to know how they can be more sustainable in regards to shopping while understanding its benefit and how one person can make a difference
		Reflect Next time I will... I wonder if...	• I wonder if the application can also educate consumers on how to disregard clothes if they can't be donated or sold
		Connect This is like... This reminds me of...	• I haven't seen an application like this yet in the fashion industry. Usually it is just news articles highlighting information but this app is unique and different

Other Notes	User can be contacted for more details or inquiry

Figure 3: Think Aloud Study - *Participant 1*

Thinking Aloud Chart

Participant Age: 20
Sex: Male
Education: Undergraduate
Occupation: Student

Overall Feeling:
☺ 😐 ☹

Before	During / After		
Before		**Predict** I predict... I think _____ will happen	• be introduced to shops that are sustainable and ethical • advocate what shops are sustainable and what are not • educate users regarding why it is crucial to shop sustainable • visually appealing application to attract more audience
	During	**Picture** I can see... I can picture..	• tips, current news, impact • modern and bold design that is yet sleek • "i can picture one being confused about the nav bar and some features. I would want a tutorial"

		Question
		Why did..?
		What does _____ mean?
		How do I...?
			• When first interacting with the home screen:
			  o how do I know how I can earn rewards?
			  o how do I redeem them?

		Clarify I am confused about... I didn't expect....	• Why are settings and privacy policy under user profile • What would it look like once you "Shop New" and various shops pop up? o What information will users be provided that motivates them to shop
		Respond I think/feel... I agree/disagree...	• why is there a tip on the first page. o "It is my first time opening the app and I am already introduced to a tip...better if I was a returning consumer" • I like how well organized the visual design is. Makes it easy to follow. • I like the current news
	After	**Summarize** What it's saying is... The point is...	• I think the application is a hub for people who want to know how they can be more sustainable in regards to shopping while understanding its benefit and how one person can make a difference
		Reflect Next time I will... I wonder if...	• I wonder if the application can also educate consumers on how to disregard clothes if they can't be donated or sold
		Connect This is like... This reminds me of...	• I haven't seen an application like this yet in the fashion industry. Usually it is just news articles highlighting information but this app is unique and different

Other Notes	User can be contacted for more details or inquiry

Figure 4: Think Aloud Study - *Participant 2*

Thinking Aloud Chart

Participant Age: 21
Sex: Female
Education: Undergraduate
Occupation: Student

Overall Feeling:
☺ 😐 ☹

Before		**Predict** I predict... I think _____ will happen	• introduced to shops that are sustainable • Diy and Tips to be sustainable • I can shop using this application or it routes me to the online website of the designated store.
	During	**Picture** I can see... I can picture..	• bold visuals that make the application trendy • unique nav bar • "I can picture one using this as a hug to initiate their shopping experience rather than on google as it is a hub"
		Question Why did..? What does _____ mean? How do I...?	• What does Gloset mean? Maybe it should be on the landing page rather than the tip. • What if my way of transportation is bicycle? • What would happen ideally if I press around you? • What does feedback mean?
		Clarify I am confused about... I didn't expect....	• I didn't expect such color scheme in the beginning as does not fit into an industry like fashion company color scheme • I didn't expect current events to be part of this application. It is very informative.
		Respond I think/feel... I agree/disagree...	• I feel like the question regarding incentives and rewards need to be reworded as the language is too professional/confusion. Might be a misleading question. I would also not ask the location question as it is usually a system question • After the questionnaire the screen should maybe say "Organizing your data".
	After	**Summarize** What it's saying is... The point is...	• I think the application is seeking to motivate ethical behavior by highlighting one's impact on the environment and provides rewards and long lasting clothes as an incentive. • The menu itself sounds sustainable such as the use of terms "thrift,rent,donate"
		Reflect Next time I will... I wonder if...	• I want to see the difference between shop new and thrift pages • I wonder if MyCloset page can also be like a wish list rather than outfits already existing in one's closet
		Connect This is like... This reminds me of...	• The MyCloset page reminds me of Pinterest

Other Notes	User can be contacted for more details or inquiry User feedback mostly focused on questionnaire section and how it can be reworked better to collect data that can help us understand user behavior and promote brands that fit into their style and budget.

Figure 5: Think Aloud Study - *Participant 3*

Thinking Aloud Chart

Participant Age: 20
Sex: Male
Education: Undergraduate
Occupation: Student

Overall Feeling:
☺ 😐 ☹

Before		**Predict** I predict... I think _____ will happen	• be introduced to shops that are sustainable and ethical • gamification techniques to promote sustainable behavior • "something new something unique"
	During	**Picture** I can see... I can picture..	• tips, current news, impact, my wardrobe • questions for data collection • rewards that I can use for deals • well organized elements for signup/login and homepage
		Question Why did..? What does _____ mean? How do I...?	• why do I need to mention my sex? ○ should just be listed as in "shop for men/women" • do you use my "liked brands" to find brands curated to me. • how do I collect points? • how do I shop if I am on MyCloset page? Do I need to go back to home
		Clarify I am confused about... I didn't expect....	• I am confused why I need to fill out a survey as it doesn't list reason • I am confused an in why settings and legal documents like privacy policy are under user profile
		Respond I think/feel... I agree/disagree...	• I feel modern and excited due to its edgy design. I feel like I will be able to explore trendy clothes. • too many loading pages initially • I think having images as a background for store info might be too much
	After	**Summarize** What it's saying is... The point is...	• I think the idea it is promoting is that sustainable fashion is accessible and we don't need to move towards fast fashion. Being so resourceful I feel like if properly made and marketed, it could have influencer sponsoring it.
		Reflect Next time I will... I wonder if...	• I wonder if somehow small businesses could be incorporated into this as often they are more sustainable than mainstream brands. • Next time I would want to see options to rent as that is not an option I knew I had. Especially in Canada.
		Connect This is like... This reminds me of...	• This reminds me of Instagram shop but this is more curated to sustainability and resources

Other Notes	User can be contacted for more details or inquiry Plugin for applications (like an api)?

Figure 6: Think Aloud Study - *Participant 4*

Thinking Aloud Chart

Participant Age: 23
Sex: Female
Education: Undergraduate
Occupation: Student

Overall Feeling:

☺ 😐 ☹

Before		**Predict** I predict... I think _____ will happen	• I think the application will have a list of shops and I will be able to shop in-app • there will be resources regarding "what makes a brand sustainable"
	During	**Picture** I can see... I can picture..	• trendy design • thorough research regarding what applications are sustainable or not • iconography for accessibility
		Question Why did..? What does _____ mean? How do I...?	• why would I want to have my notifications on? Are there special offers • how do I change my password?
		Clarify I am confused about... I didn't expect....	• I am confused regarding the significance of MyCloset • why is there an additional step to sign up/login. I can be redirected to login directly and then have an option for sign up. One screen can be eliminated
		Respond I think/feel... I agree/disagree...	• I feel like I would feel motivated to shop sustainable due to rewards and the fact that I can share my stats. Especially with the increase of social media. • The color and design makes me want to use the application • feels like curated to an individual person needs and style • I like "what are you looking to...." as it tells the user what to expect
	After	**Summarize** What it's saying is... The point is...	• The application is catering to people who want to shop sustainable and remain sustainable with the current wardrobe (tailor and sell). The point is to identify the positive impact of shopping sustainable while making it more accessible. Furthermore highlighting how many people switch from non sustainable methods to sustainable.
		Reflect Next time I will... I wonder if...	• Next time, not next iteration I would want survey questions catered more to my fashion preferences, shopping behavior, and reasoning why it is required.
		Connect This is like... This reminds me of...	• the grouping of elements remind me of Uber but not really at the same time. It might just be because its a prototype

Other Notes	User can be contacted for more details or inquiry User identified how the application might still not cater to low income families. Especially. "shop new " as sustainable brands are often high prices Unify the branding guideline more / narrow it down

Figure 7: Think Aloud Study - *Participant 5*

Gloset: A Green Trendy Wardrobe
An Affinity Diagram highlighting user critiques during Think Aloud study.

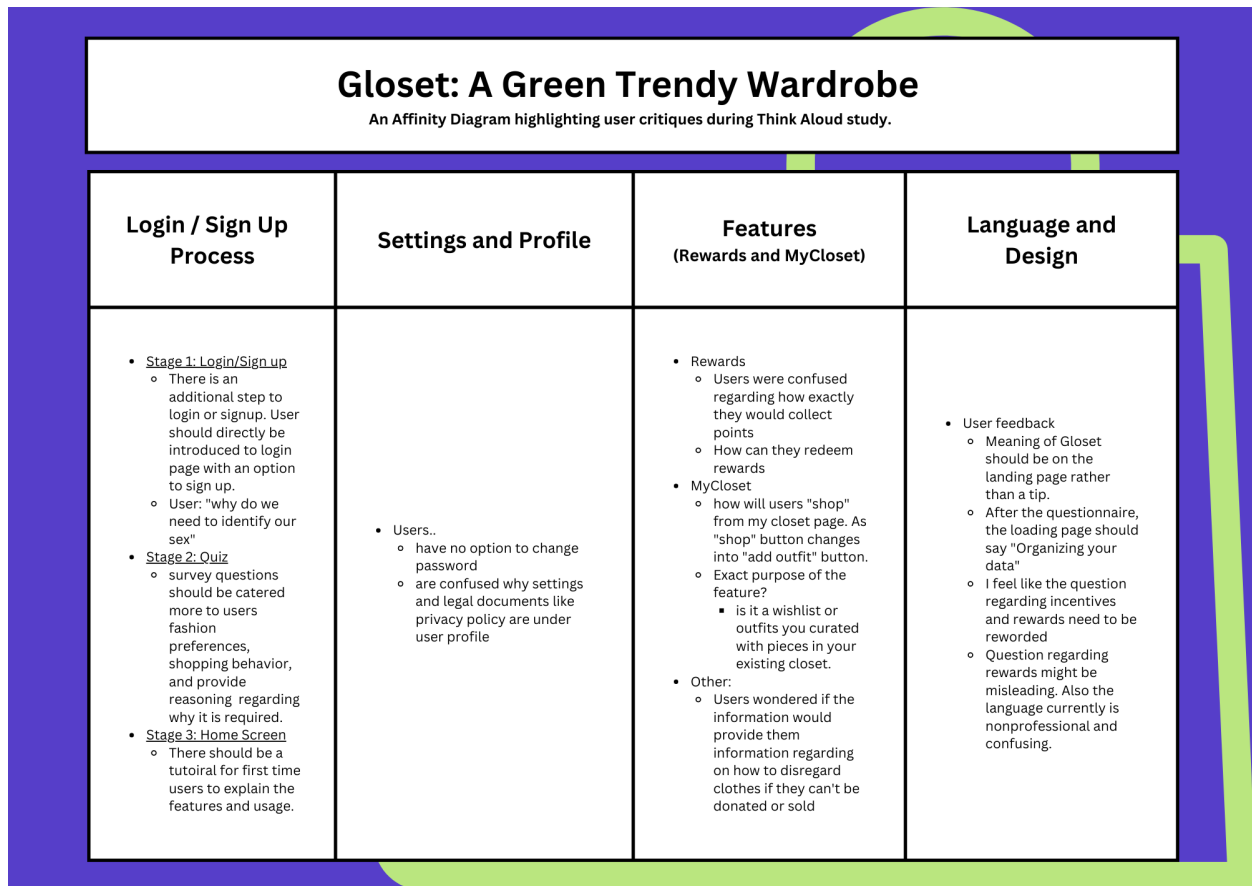| Login / Sign Up Process	Settings and Profile	Features (Rewards and MyCloset)	Language and Design

• Stage 1: Login/Sign up
  ◦ There is an additional step to login or signup. User should directly be introduced to login page with an option to sign up.
  ◦ User: "why do we need to identify our sex"
• Stage 2: Quiz
  ◦ survey questions should be catered more to users fashion preferences, shopping behavior, and provide reasoning regarding why it is required.
• Stage 3: Home Screen
  ◦ There should be a tutoiral for first time users to explain the features and usage.
	• Users..
	  ◦ have no option to change password
	  ◦ are confused why settings and legal documents like privacy policy are under user profile
		• Rewards
		  ◦ Users were confused regarding how exactly they would collect points
		  ◦ How can they redeem rewards
		• MyCloset
		  ◦ how will users "shop" from my closet page. As "shop" button changes into "add outfit" button.
		  ◦ Exact purpose of the feature?
		    ▪ is it a wishlist or outfits you curated with pieces in your existing closet.
		• Other:
		  ◦ Users wondered if the information would provide them information regarding on how to disregard clothes if they can't be donated or sold
			• User feedback
			  ◦ Meaning of Gloset should be on the landing page rather than a tip.
			  ◦ After the questionnaire, the loading page should say "Organizing your data"
			  ◦ I feel like the question regarding incentives and rewards need to be reworded
			  ◦ Question regarding rewards might be misleading. Also the language currently is nonprofessional and confusing.

Figure 8: Think Aloud Study Affinity Diagram - *highlights user critiques*

6 ANALYSIS

Based on the data collected from our Think Aloud Study, we were able to determine our users' motivations and struggles they faced when it came to shopping sustainably. Overall they were generally pleased with our application and also agreed this would be an effective tool in guiding someone to living a more eco-friendly lifestyle. Still, there were some changes and confusing points that needed to be addressed. We discovered that our target demographic would mostly be women under 35 as they demonstrated the most interest in what we had to offer. They also stated that motivations behind their spending/shopping habits were due to the influences of social media platforms as well as influencers.

Moving onto the feedback we got from users, first of all, some users were hesitant to identify their gender when signing up on our app, deeming it unimportant or irrelevant and asking "why it mattered". We addressed this question by informing them that it was important for our data collected as it would help us get a better understanding of how different genders view, incorporate, or struggle with sustainability. This way we would also be able to better cater the app to fit its individual users. However, for our iteration we deem this information to be incorporated within our design. Furthermore, some were confused by the meaning of 'Gloset' and thought that the term/meaning should be addressed on the landing page rather than having a tip. While we anticipated that customers who downloaded our app would be familiar with its objective and concept, this was an important point to notice. Especially since being exposed to a tip right away might be demotivating for first-time users. Changing this for the next iteration would also enhance our branding. Finally our users suggested that the "My Closet" feature be

reworked as they didn't understand its purpose. While they liked the idea of having a closet full of one's curated outfits they were not comprehending why someone would put their already existing outfits there. They however suggested implementing a "wishlist" of items they were looking to buy or "pick a look" feature that would allow for categorizing items by themes such as going out, work, weekend, lounging etc. Furthermore, it was stated that there should be a feature that allows for quick/easy shopping through the "My Closet" feature or something that would help give recommendations from local sustainable shops that could enhance or complete an outfit. Overall, we were very pleased with the feedback users had given us as it helped us better develop our product and potentially broaden our user base.

7 DISCUSSION

Through the conducted research we have found that the Gloset application's main method of preventing climate change is by incentivizing individuals to shop sustainably. The participants of the study were aware of the climate change crisis prior to conducting the research and despite knowing, they still felt as though it was not enough of an incentive. This is because when they were presented with the app, it was made clear that someone who doesn't already have somewhat of a gravitation towards having a healthier planet, they might not be as likely to get into it. However, there were some interesting points made about how marketing can increase the incentive and thus result in people wanting to join for reasons other than just being sustainable. For example, this can be done through popular influencers pitching the product to their following. The application is catered to people who want to shop sustainability but by increasing this demographic through marketing, we could potentially bring about a bigger change which can cause an environmental and economical shift of a varying magnitude.

The implication of this application could cause a shift depending on the popularity and frequency of use. These two factors are heavily dependent on how well the marketing is done. With TikTok being a big application that holds many users of our target demographic, the app can be used to increase user numbers. As we've seen so many regular people blow up from just one video which changed their life, the same can work with an app with strategic marketing. In the event that the application does reach a higher user rate, there would be a predicted decrease in fast fashion consumption. The aim of this app is to create this sort of inverse correlation between the number of users on the app and the amount of fast fashion consumption occurring. The decrease can be attributed to the social status linked with using the app due to its popularity. For reference, beReal is a great example of how once an application catches on, people are quick to hop in it for fear of missing out. With this kind of incentive in mind and an increase in user rates, we can expect more people to stick with sustainable shopping options thus resulting in more climate control through simply efficient marketing.

The idea here is to promote sustainable fashion and make it more accessible. Through our research, we found that a big reason people continue to support fast fashion is due to a lack of easy accessibility. With the application, the goal is to show people that being sustainable is just as easy. This we have done successfully according to participants but there is a lot of encouragement for good marketing. Getting the idea of 'stream-lined sustainability' into people's minds is key here because that is what's going to get people on board.

Something we noted in our research was that users were hesitant to identify sex when signing up for the application. The concern was mainly the reasoning behind this required field of information and this was portrayed through the question "why does it matter". To make it more clear we could include the reasoning behind the requirements but for the purpose of this application, we require this data for personal data collection in identifying who is interested in sustainable behaviors.

Another comment made by a participant was regarding the name of the application, 'Gloset' and the opening screen. The landing page came across as a bit jarring with the immediate introduction through the appearance of advice for the user who hasn't even joined the app yet. This can come across as demotivating and just cause a turn away from the app for the user. There's also the fact that the user has yet to understand the meaning behind the name 'Gloser'. Replacing the advice on the landing screen with an explanation as to why the anime is what it is, is a lot better as it allows them to know what they are signing up for and the purpose of the application.

8 CONCLUSION

In conclusion, our group has attempted to address climate action by focusing on fast fashion and how it promotes unsustainable consumerism. In our research, we identified the preexisting solutions and challenges which were incorporated with our knowledge of modern technology to propose a solution. We introduced a mobile application, Gloset, established on behavioral change techniques that addressed barriers to sustainable consumption in the fashion industry; lack of knowledge, lack of availability, financial barriers, lack of trust, and much more. While doing so, to test the effectiveness of our solution, we conducted usability tests which discovered room for improvement while successfully identifying that our application is capable of our goal. For the future, it is suggested that the group or other other fellow researchers focus on data collecting while developing applications to encourage change. This information can be gathered during the sign-up process or while users are using the programme. Collecting such data will help them to notice the change they are promoting while understanding their demographics. Furthermore, the study and data shown below may be utilized to better understand how to leverage behavioral tactics within the application to promote a social cause.

9 ACKNOWLEDGEMENTS

References

[1] Akilah R. Martin & Joseph C. Chen. 2015. Barriers to sustainability in mature-age adult learners: working toward identity change. (2015). DOI:https://doi.org/10.1080/13504622.2015.1075192

[2] Bick, Halsey, E., & Ekenga, C. C. The global environmental injustice of fast fashion. *Environ. Health*, 17(1), 92–92. DOI:https://doi.org/10.1186/s12940-018-0433-7

[3] Chekima, Syed Khalid Wafa, S. A. W., Igau, O. A., Chekima, S., & Sondoh, S. L. 2016. Examining green consumerism motivational drivers: does premium price and demographics matter to green purchasing? *J. Clean. Prod.* (2016), 112, 3436–3450. DOI:https://doi.org/10.1016/j.jclepro.2015.09.102

[4] Climate Council. 2021. Fast fashion needs to slow down for the climate. Retrieved from https://www.climatecouncil.org.au/resources/fast-fashion-climate-change/

[5] Douglas, B. D., & Brauer, M. 2021. Gamification to prevent climate change: A review of games and apps for Sustainability. *Curr. Opin. Psychol.* (2021), 42, 89–94. DOI:https://doi.org/10.1016/j.copsyc.2021.04.008

[6] Joy, A., Sherry, J. F., Venkatesh, A., Wang, J., & Chan, R. 2012. Fast Fashion, Sustainability, and the Ethical Appeal of Luxury Brands. *Fash. Theory* (2012), 16(3), 273-295. DOI:https://doi.org/10.2752/175174112X13340749707123

[7] Martin, & Chen, J. C. 2016. Barriers to sustainability in mature-age adult learners: working toward identity change. *Environ. Educ. Res.* (2016), 22(6), 849–867. DOI:https://doi.org/10.1080/13504622.2015.1075192

[8] Nielsen, J. 2000. Why you only need to test with 5 users. *Nielsen Norman Group*. Retrieved from https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/

[9] Niinimäki, Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. 2020. The environmental price of fast fashion. *Nat. Rev. Earth Environ.* 1(4), (2020), 189–200. DOI:https://doi.org/10.1038/s43017-020-0039-9

[10] Sullivan, Marsh, S., Halvarsson, J., Holdsworth, M., Waterlander, W., Poelman, M. P., Salmond, J. A., Christian, H., Koh, L. S., Cade, J. E., Spence, J. C., Woodward, A., & Maddison, R. Smartphone Apps for Measuring Human Health and Climate Change Co-Benefits: A Comparison and Quality Rating of Available Apps. *JMIR MHealth UHealth* 4(4) , e135-. DOI:https://doi.org/10.2196/mhealth.5931

[11] Sunio, & Schmöcker, J.-D. 2017. Can we promote sustainable travel behavior through mobile apps? Evaluation and review of evidence. *Int. J. Sustain. Transp.* (2017), 11(8), 553–566. DOI:https://doi.org/10.1080/15568318.2017.1300716

[12] Whalen, V. 2022. Fast Fashion and Climate Change 101. *Action for the Climate Emergency*. Retrieved from https://acespace.org/2022/06/17/fast-fashion-101/