

SECOND: REDESIGNING THE TEXTILE RECYCLING EXPERIENCE
USING A CIRCULAR ECONOMY

by

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HONORS THESIS

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ABSTRACT

Environmental concerns have been growing within recent years, and actions to remedy the effects of human waste has sparked conversations across the globe. One factor that many often overlook is the environmental impact of the clothing industry, or fast fashion to be specific. According to Merriam-Webster, fast fashion refers to “an approach to the design, creation, and marketing of clothing fashions that emphasizes making fashion trends quickly and cheaply available to consumers” (2019). The rise of fast fashion has had detrimental effects on the environment along with fueling American consumerism due to its make-and-dispose business model. This thesis focuses on developing a circular economy in the fashion industry that challenges the make-and-dispose model and reexamines the textile recycling experience. The Ellen MacArthur Foundation defines that, “a circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (2017).” Large fashion brands such as H&M and Levi Strauss & Co. have begun employing clothing recycling methods into their business models, such as having clothing donation bins in stores. For this project, a textile drop-off donation bin connected to an online retail app and circular brand experience was prototyped to investigate the viability and sustainability of a circular business model in the fashion industry.

CHAPTER 1: INTRODUCTION

In recent years, textile markets have grown around the world due to population growth and fashion cycles. Fast fashion and social media marketing have led to high levels of consumption and even higher levels of waste generation (Pensupa et al., 2017, Abstract). Textile waste, as well as textile manufacturing, is causing detrimental effects to the environment and social impacts to industry workers. Nearly 100% of all textiles are recyclable, however 85% of all textiles are ending up in landfills (Weber et al., 2017, 207). Through research, it was noted that most people do not drop off their old clothes at donation/recycling bins because of: lack of convenience, untrustworthiness, and a general lack of awareness and education (Koch & Domina, 1997, p. 13).

Thesis Objective

This thesis focuses on developing a circular economy business model in the fashion industry that challenges the make-and-dispose model and reexamines the textile recycling experience. This project is divided into two parts. The first part is to examine the fashion industry in regard to the growing textile waste issue, as well as understanding today's consumer behavior. The second part is to create and prototype a textile drop-off donation bin and circular brand experience based on human-centered design research to investigate the viability and sustainability of a circular business model in the fashion industry.

Thesis Organization

The thesis is organized into five chapters. The first chapter introduces the textile market and the objective of this project. Chapter 2 defines the preliminary research, such as: fast fashion, the textile donation business, circular economy, and the Generation Z consumer. Chapter 3 addresses the problem of textile waste and recycling and the implications of this industry from a consumer standpoint. Chapter 4 introduces the brand process and experience, including the prototyping process. Chapter 5 analyzes the results of the prototyping experiment and concludes the thesis by examining the viability of a circular business model in the fashion industry, in addition to addressing the future potential of the brand and research opportunities.

CHAPTER 2: PRELIMINARY RESEARCH

Fast Fashion

Within this new millennium, the fashion industry has been revolutionized by a phenomenon called, fast fashion. According to Joy et al. (2012), “Fast fashion—low-cost clothing collections based on current, high-cost luxury fashion trends—is, by its very nature, a fast-response system that encourages disposability” (p. 275). Fast fashion offers consumers the ability to purchase the latest trends just days after they appear on the catwalk. While highly profitable, providing affordable and trend-sensitive apparel also raises the issues of unethical manufacturing and sustainability.

According to the World Trade Statistical Review (2019), garment factories and garment production disproportionately take place in developing countries in Asia such as China, Bangladesh, and Vietnam due to more relaxed labor laws (p. 60). The garment industry has been known to employ the use of sweatshops, child labor, and low wages. Fast fashion, in addition to the rise in social media marketing and a new generation of young consumers, has caused a surge in the creation of more garment factories and harsher working conditions to meet the demand of consumption. These ready-to-wear, or off the rack, garments require a rapid turnover time from runway to rack; thus, leading to poorer quality materials, toxic chemicals (such as formaldehyde), and exploitative labor. This form of fashion does not focus on durability, functionality, nor sustainability. Therefore, these garments are worn a few times and then discarded as quickly as the trends passes.

The overconsumption of fast fashion combined with improper disposal methods is not only causing ethical problems, but also growing environmental concerns as our

landfills are filled with billions of pounds of post-consumer textile waste each year. Birtwistle and Grete (2009) suggests that, “Increasing volumes of textiles are being produced, purchased and disposed of in landfill sites, which affect the environment. Research has identified the influences in increased purchase behaviour and the tendency to keep clothing for a shorter time” (p. 190). Manufacturers now rely on cheaper fabrics, which are often produced inefficiently and heavily polluting, and low labor outlay to increase the profit margins between what the clothing costs to produce and what consumers will pay for their clothing. With an increasing variety of poorly made clothing with a short life spans, a dangerous cycle of waste is created resulting in a growing consumption of cheap goods. These discarded goods not only pollute the environment, they also pollute Third World countries as second-hand clothing, thus also suppressing their local economies (Palomo-Lovinski & Hahn, 2014, p. 89). The emergence of this concept of “throwaway” fashion is fueled by American consumerism and a new generation of online consumers.

Understanding the Current Market

The current fashion market is undergoing major shifts due to the emergence of e-commerce. The introduction of digital innovation, increasing globalization, and overall changes in consumer spending habits have caused many fashion retailers to shut down this last year. With the birth of e-commerce, businesses were now able to reduce purchasing costs, manage supplier relationships, streamline logistics and inventory, and develop strategic unique selling points to set them apart from competitors. E-commerce now allows companies to improve communications within the supply chain while

simultaneously enhance services towards consumers, therefore providing chances for competitive differentiation (Zhenxiang & Lijie, 2011, p. 195). As the shift towards e-commerce grows, more companies are turning their focus towards their online marketplaces rather than their physical retail store. A major contributor to this shift towards online shopping is the new Generation Z consumers.

The Generation Z Consumer

The key to understanding the current market trends and where they are headed relies on examining the new emerging demographic of consumers. Generation Z is revolutionizing the consumer landscape as the oldest members enter the workforce and the youngest members reach working age. Generation Z refers to the demographic cohort following Millennials of people born between 1996 and 2010. This generation is most notable for being the generation that does not know life before the internet. Members of this generation are characterized by being tech-savvy, ethically aware, and prefer individual identity over labels (Francis & Hoefe, 2018, p. 2). Generation Z consumers are more pragmatic compared to their idealistic Millennial predecessors. Millennial consumers were born during a time of economic prosperity, resulting in different spending habits compared to cost conscious Generation Z consumers who were born during an economic recession. Millennial consumers grew up during a time when wearing brand names was popular and symbolized your fashion sense. On the other hand, Generation Z consumers celebrate individuality and tend to avoid being defined by specific brands (Gutfreund, 2016, p. 246). The preference of individuality translates to

social media and how companies have utilized “influencers” to market their brand rather than traditional advertisements.

The Generation Z group of digital natives and their utilization of social media communities and influencers has changed buying and selling techniques in the clothing retail landscape. Rather than brand loyalty, Generation Z’s loyalty lies within their online communities and the influencers they follow. Influencers are people who have the power to affect the purchasing decisions of others because of their authority, knowledge, position, or relationship with their audience. Influencers are identified by their large social media followings and their prominence in their own niche online communities (Hu, Dandan & Chengjun, 2019, p. 1). Generation Z has been noted to be more ethically aware and value brands that they can trust and support. Trust plays a critical role in consumer behavior and spending habits. Thus, consumers are more likely to make a purchase when endorsed by a social media influencer they follow or by word-of-mouth from friends and family. Marketers have been using social media marketing to their advantage by building positive personalized relationships with their consumers through the use of influencer endorsements as well as their own personal social media pages. “Social media marketing activities provide better communication opportunities to marketers for wider reach and building long term effective relationships with customers. The growth of social media marketing activities has facilitated consumers to interact virtually with other consumers across globe about all brands under different product categories” (Gautam & Sharma, 2017, p. 873). Consumers are now able to communicate effectively with brands, along with other potential consumers, creating a community designed with the users in mind.

Defining the Human-Centered Design Experience

Designing brand experiences centered around the target consumers is critical in today's digital age where brands are constantly competing to stay trendy and innovative. As technology advances and more companies utilize technology within their brand experiences, such as AR, VR, and digital marketing, the need for a humanistic approach on brand experiences is more crucial than ever. Human-centered design is defined as an approach in design-thinking that involves the users and considers the human experience within the design process (Crandall, 2019, p. 41). The use of Human-Centered Design is especially integral when considering Generation Z consumers who value authenticity as one of their top factors when purchasing from a brand.

Defining a Circular Economy

The current economy in the fashion industry operates on a linear model. A linear economic model often refers to as the, "take, make, and dispose" model which lacks key elements within the process to incorporate sustainability (Sillanpää & Neibi, 2019, p. 1). The concept of a circular economy is relatively new; however, fashion brands have already begun to implement steps to adopt a circular economic business model. The Ellen MacArthur Foundation defines that, "a circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (2017)." A circular economy focuses on a production and consumption model involving reusing, repairing, refurbishing, and recycling existing materials and resources to keep materials within the economy, rather than using new

resources. Big brands such as H&M and Adidas have begun employing circular economic tactics within their business models to both, appeal to their target consumers as well as reduce their personal environmental impacts. These tactics include offering in-store drop-off receptacles for textile recycling and also marketing new products made out of recycled plastic waste.

Integrating a successful circular economy model into the current fashion industry is difficult because it requires innovation within every step of production and consumption, changes in both consumer behavior and culture, and the implementation of human-centered design (Lofthouse & Prendeville, 2018, p. 452). Design plays an important role in the viability of a circular business model within a capitalistic and free market society. From engineering product life-extensions, understanding the duality of human and technological innovation, and recognizing human behavior on a global consumer scale; all of these aspects need to be considered within the design process for a successful circular business model.

CHAPTER 3: ADDRESSING THE PROBLEM

Textile Waste

Textile waste is a growing problem within our global fashion industry. Not only are improper disposal techniques causing billions of pounds of textiles to end up in landfills, waste is generated at every level of textile and garment manufacturing. Therefore, each stage of the textile manufacturing and consuming process must be reexamined to reduce pollution.

Beginning in the manufacturing process, the main issue lies within the economics of the textile recycling methodology. While reducing the amount of textiles being manufactured might be infeasible due to the growing demand of the fashion industry, recycling the waste as many times as possible might be the more practical option. However, while recycling is the most practical approach, it is not the most cost-efficient. Profitability is one of the key factors companies take into consideration when implementing changes within their business models. Thus, adopting a textile recycling method into a fast fashion business model would be an unpopular option. Despite the economical restrictions, there are other methods of recycling that can be implemented within the textile manufacturing process. Such as: utilization of leftover yarn or cut portions of other garments, conservation and recovery of resources in the dyeing process, and recycling of water in the chemical processing step (Sule & Bardhan, 2001, p. 224). By utilizing all the previously discarded resources to their fullest extents, companies can minimize their environmental impact while still remaining cost-efficient.

Contrary to the manufacturing process, the disposal methods of textiles allow for more control from consumers. However, this also addresses the issue of a lack of general

awareness involving proper textile disposal methods as well as consumers' self-accountability. There are three main disposal methods that most consumers utilize: recycling, donation, and trash.

The Science of Textile Recycling

Reducing the carbon footprint of the textile product's life cycle is imperative to slow the growing effects of environmental damage. "Carbon footprint measurement of a product involves measurement of the amount of greenhouse gases produced through the entire life cycle of the product" (Muthu et al., 2012, p. 1065). One possible way to reduce carbon emissions in the textile process chain is to recycle textile materials in the manufacturing process and at the end-of-life stage. Every stage of the textile product life cycle is responsible for carbon footprint. Textile waste of various forms occurs at different stages of the product's life cycle. Textile waste can be classified in two different ways, pre-consumer waste and post-consumer waste. Pre-consumer waste refers to the waste that occurs during the production stage of textiles, while post-consumer waste refers to the textile products that are discarded once they are obsolete or unwanted (Wang et al., 2003, p. 698).

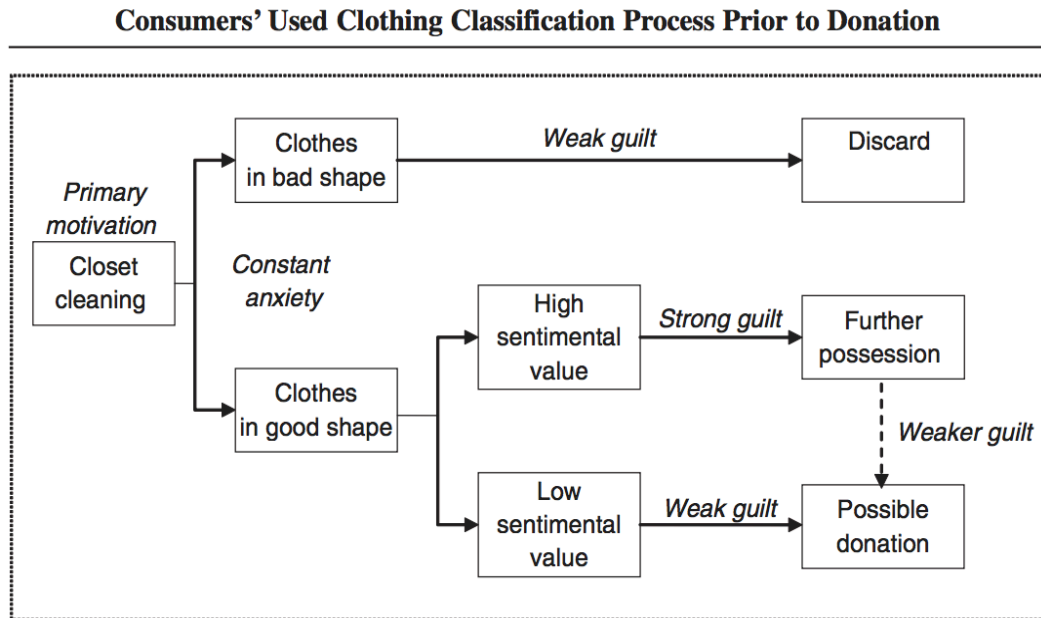
Most of textile and fibrous waste is composed of a mix of natural and synthetic polymeric materials such as cotton, polyester, nylon, etc. Therefore, the recycling process of textile waste can be quite difficult with our current technologies despite being nearly 100% recyclable. Since most of our clothing is made with a mix of organic (cotton) and inorganic (plastic) materials, the recycling process requires these materials to be separated to be properly recycled for the potential to be made into a new product. This process can be very tedious, expensive, and wasteful with other resources like heat and

water. Thus, wide-scale commercial textile recycling is not a popular choice with fashion and textile producing companies. Therefore, a more feasible, sustainable option is to donate or reuse textiles rather than trying to remanufacture the material into a new product.

The Donation Business

As consumption of textiles has increased in the United States, the level of social consciousness on the consumer's part has also increased (Roberts, 1995, p. 97). While it has been reported that Americans contribute billions of pounds of post-consumer textile waste to landfills each year, it has also been reported that millions of pounds of used clothing and textiles are actively being donated yearly as well. Donation includes handing down clothes to family members and friends, nonprofit organizations such as Goodwill, and other religious organizations. Despite there being active donations of textiles, a study done by Jung Ha-Brookshire and Nancy Hodges in the *Clothing and Textiles Research Journal* found that most people's motivation to donate was to "get rid of stuff" rather

than social consciousness (2009).



Source: Ha and Nelson Hodges (2006). Copyright International Textile and Apparel Association. Adapted with permission of the authors.

Figure 1. Consumers' Used Clothing Classification Process Prior to Donation
(Ha-Brookshire & Hodges, 2006).

In Figure 1 above, this study found that sentimental value and wearability played an important role in people's decision-making concerning whether to donate, discard, or keep. After the decision-making process, the study found that most participants chose passing down used clothing to close family members and friends as their first choice out of all the donation outlets. However, this choice poses some difficulties due to the issue of size restrictions. Therefore, the majority of clothing were donated at donation sites. Participants expressed that convenience was the biggest factor in choosing a donation site, rather than what the donation institution stood for or would do with the donated items. "The location, operating hours, parking space, and availability of employees at

donation sites were described as specific examples of convenience sought by participants” (Ha-Brookshire & Hodges, 2009, p. 189). Thus, the act of donating clothes was more about relieving guilt of unworn and unwanted clothes rather than for social responsibility.

The study concluded in finding that clothing donation is just part of the clothing consumption cycle. Participants found relief and pleasure in donating their clothing due to the excitement of being able to purchase new clothing and products. These findings suggest gaps in consumer perceptions of the donation business as well as lack of awareness in social responsibility concerning the environment.

Alternative Methods of Textile Disposal

In addition to textile recycling and donation, there are other methods of disposal to consider. These alternative methods include things such as modification/reusing the textiles for a different function (rags), consignment, or trash. A study conducted by Kathryn Koch and Tanya Domina in the *Journal of Consumer Studies and Home Economics* (1997) found that, “the most frequently used method of disposal was to pass the textile product on to family or friends, followed by use as rags, accounting for 82% and 76% of the sample respectively. Donation to Goodwill or Salvation Army accounted for 64% of the responses to textile disposition methods. The least used methods of textile disposal were church donation (36%), returning to parents for recycling (35%) and consignment (30 %)”. This study reached the same results as the study conducted by Ha-Brookshire and Hodges. Convenience and ease play the biggest role in textile disposal patterns as well as emotional sentiment and attachment to certain products. However, the

difference between the two studies is the hypothesis proposed by Koch and Domina. Koch and Domina concluded that although textile recycling by breaking down the material to be reformed into a new product is the end goal, it is not economically feasible. They suggested that textile reusing strategies can accomplish more environmentally in the long run. In addition to reuse strategies, they also emphasized the importance of consumer education regarding textile recycling and disposal in increasing more consumer recycling participation. “The degree to which a textile product life cycle can be modified or extended depends a great deal on consumer education. Just as important is the willingness of the textile industry, including manufacturers and retailers, to provide outlets for textile recycling as well as new ways to add value to post-consumer textile waste” (Koch and Domina, 1997, p. 15).

Achieving a significant reduction in textile waste in landfills requires consumer education as well as manufacturer and retailer accountability. Textile recycling technologies and methodologies are still in early stages of development. However, environmental damage and global warming caused by the textile industry is increasing faster than these recycling technologies can be developed. Thus, the necessity for consumer education and the emphasis on reuse and reduce strategies is imperative rather than advancing recycling technologies to truly make an impact on preventing textile waste in landfills.

Implementing a Circular Business Model in Fashion

A circular economy is a key driver in a transition to a sustainable industry. There are many strategies to implement within a circular economy, however, the fundamental strategy is closing, slowing, and narrowing resource loops. “Slowing loops refers to the design of long-life goods and product-life extension – the use period of products is extended and/or intensified, resulting in a slowdown of the flow of resources as it reduces the total need for products” (Bocken et al., 2018, p. 164). The fashion industry, especially fast fashion, has predominately followed a linear economic model resulting in growing amounts of textile waste generated each year. Clothing production has doubled within the last 15 years, whereas clothing utilization has been decreased by approximately 36% (Ellen MacArthur Foundation, 2017). There are several proposed strategies to slow down resource loops by reexamining the design stage of products in the manufacturing and the end-of-life stages of the textile life cycle. In the manufacturing stage, prolongation of product life is essential in reducing consumption. To successfully design for the longevity and quality of products, fashion companies need to create new understandings and relationships with their end users. End users’ needs and desires need to be considered for longer use-time as well as better product satisfaction (Niinimäki, 2017, p. 152). Design has to contribute strongly to minimize environmental impact through four different paths: Longevity, Service, Reuse, and Material Recovery (see Figure 2).

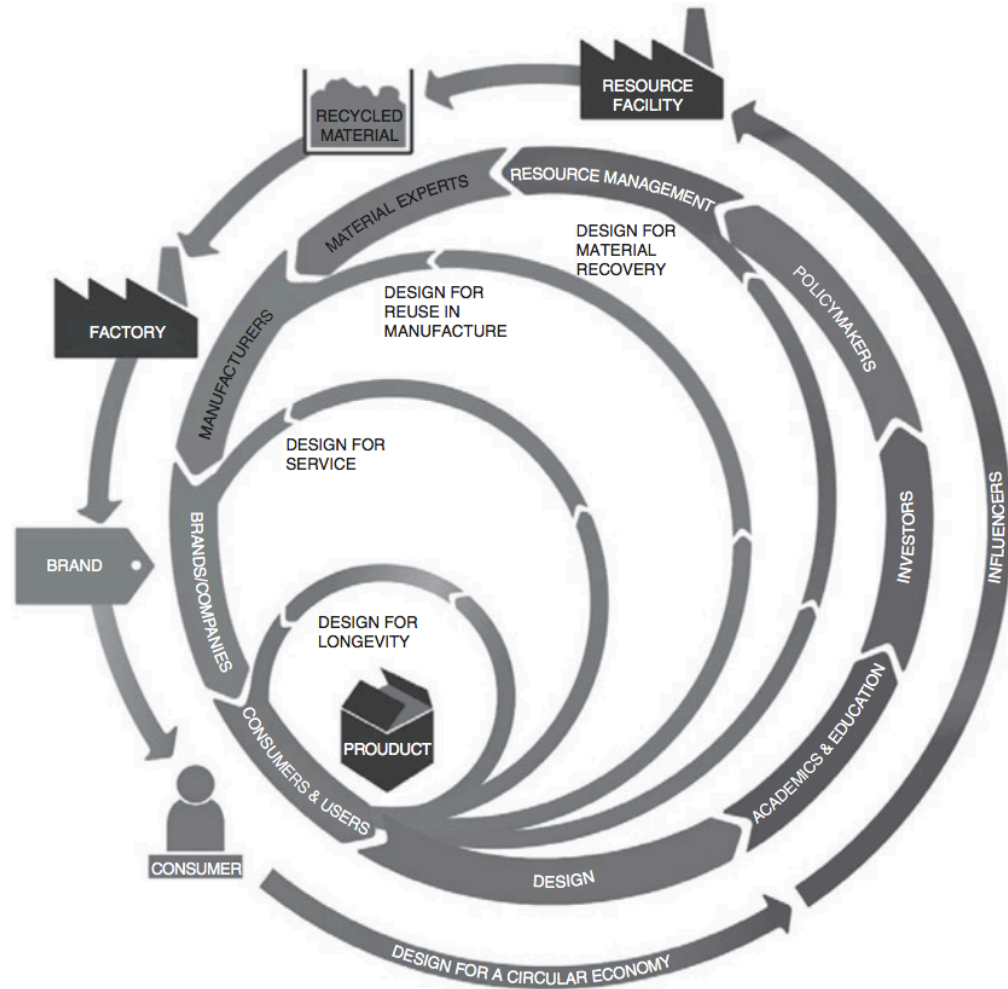


Figure 2. The four models of DCE, design in a circular economy (RSA Action and Research Centre, 2016)

Designing for longevity: The critical stakeholders in this level are the consumers and their willingness to use their garments longer and changing their consumption habits.

Designing for service: The stakeholders in this level are companies and is dependent on their responsibility to develop the product-service they offer to extend the use-time of garments and offer more sustainable ways to fulfill consumer's fashion needs. Designing

for reuse: The stakeholders in this level are manufacturers who need to incorporate new

design understandings so that the reusability in products is possible. Designing for material recovery: Many stakeholders play a part in this level, including material experts, resource management experts, policymakers, investors, educators, and designers. This level is arguably the most difficult to implement due to economic, political, and technological constraints previously mentioned.

To achieve a successful circular economic business plan that can compete with the appeal of fast fashion in the marketplace, the emphasis should be placed on reusing and repairing existing products and maintaining these products within the resource loop.

Understanding the End User

The success of creating a fashion brand with a circular business model relies on understanding the desires of the end users. Both Millennial and Generation Z consumers are reportedly interested in purchasing socially responsible products, even if they have to pay more for these products. However, members of the Millennial and Generation Z demographic represent the target market for fast fashion retailers (Lam & Yurchisin & Cook, 2016, p. 1). Out of these age demographics, young female adults were found to shop in fast fashion retailers most frequently. There are discrepancies between consumer beliefs and actions, thus causing unpleasant shopping experiences. These two demographics value transparency and authenticity from big brands the most. Therefore, a successful circular fashion brand needs to consider the values of these age demographics when designing the products and service experience they offer.

The first step to understanding the target end users of fast fashion is examining the current fashion and consumption trends of these users. Second-hand consumption has

quietly been on the rise in recent years and has begun to mix into today's retail marketplace (Ferraro & Sands & Brace-Govan, 2016, p. 262). Online and fashion retailers have taken notice and have begun launching their own vintage aesthetic product lines to compete. Second-hand clothing offers cheap, one-of-a-kind garments that supplies consumers with individuality in addition to a fulfilling shopping experience. The shopping experience of thrifting allows consumers to get creative with their own personal styling as well as offer a sense of fulfillment when consumers happen to find garments they like. Another factor that makes thrifting popular is the possibility of finding luxury brand items at an affordable price. Second-hand consumption offers sustainability, individuality, and affordability.

The second step is examining consumption delivery and experience trends among these users. There are four trends that characterize and influence Generation Z consumers. The first trend is innovation. Within the Generation Z age demographic, the internet has always existed. Members of this age demographic have grown up with more marketplace choices than any of their predecessors. Thus, making their expectations for innovative designs and experiences in the retail environment higher. Their purchase choices in this aspect will rely on design-based or aesthetic differentiation from other retailers. The second trend is convenience. The Generation Z demographic grew up in a fast-paced, technologically reliant society. Therefore, ease and efficiency are important function that they look for in their shopping experience. This is evident in the rising popularity in time-saving devices, fast delivery, and one-click e-commerce purchasing features. The third trend is security. Generation Z members were born and raised during an economic recession and watched their parents struggle financially during the

formative years of their lives. This economic influence is reflected in their spending habits. Generation Z consumers are more careful and particular in how they spend their money. They also tend to avoid brand loyalty and appreciate variance in their fashion choices unlike their Millennial predecessors. The fourth trend is escapism. Generation Z consumers are prone to escapist consumption trends including entertainment (movies, music, and video games), extreme sports, dining out, and seeking social “tribes” (networks of friends created through social media). The cause of escapist trends is due to the economic environment and increased responsibilities environment these members were raised in. Their desire to escape facilitated by technology and the internet has transcended to their spending habits. Consumption choices are influenced by the online communities members identify themselves with in addition to brands’ social media presence and aesthetic (Wood, 2013). Keeping these four trends in mind, a brand experience that employs innovation, convenience, security, and escapism aspects will encourage a stronger Generation Z consumer following.

An Interactive Shopping Experience

Interactive shopping experiences are a more contemporary concept that have just begun being implemented in online shopping features. “Different technologies such as augmented reality and 3D virtual models have been used to improve the online shopping experience, to the extent that the Internet has changed the role that technology plays in fashion retail” (Blázquez, 2014, p. 98). Digital revolutions have raised consumer expectations in their shopping experience higher than ever before. Before, lack of atmospheric experience and physical interaction with the product were the limitations

that set the in-store shopping experience apart from the online shopping experience. The introduction of technology innovation has blurred the boundaries between in-store and online shopping experiences. By translating variables of color, music, smell, and touch onto an online format, these atmospheric sensations can influence consumers' responses during their online shopping experiences. Increasing levels of pleasure and positive attitudes towards fashion shopping directly correlates with increasing purchase intentions.

There are different levels of interactivity in online shopping experiences. The first level is interaction with the product. By adopting technologies to allow customers to interact with products, such as virtual fitting rooms, they feel a higher sense of security which increases their purchase intention. The second level is interaction with the company. By allowing customers to communicate directly with the company and form a relationship through features such as a rewards or member system, customers will be able to feel a sense of importance and exclusivity. These are aspects that are important in gaining consumer trust. The third level is interaction with other consumers. By implementing features such as a review system or social media and networking capabilities, customers can build a sense of community and brands can garner a larger following of potential customers. All three levels of interactivity need to be considered while creating an interactive online shopping experience.

CHAPTER 4: BRAND AND EXPERIENCE DEVELOPMENT

Introducing SECOND

Following the examination of the growing environmental impact of the fashion industry, a circular economic business model needs to be implemented in today's fashion brands to reduce the effects of global warming. However, many aspects of a circular economy suggest the adoption of slow fashion over fast fashion. The complete switch from a fast fashion dominated industry to a slow fashion one is improbable in our capitalistic society. However, by examining other circular design techniques and considering the target market of fast fashion, a new brand concept can be developed to compete in a fast fashion dominated industry.

SECOND is an online consignment clothing brand experience that repairs and resells clothing collected from local donations. The emphasis of this brand is reducing post-consumer textile waste in landfills by prolonging garments' product life through reusability and repair. The unique selling point of the SECOND brand will come from the donation interactive experience. The current issue with textile drop-off donation bins is the lack of convenience, trust, and education. SECOND offers unique donation bins housed in high-traffic public spaces with a personalized donation experience that allows users to recognize their personal contributions of reducing textile waste. By allowing users to visualize their impact, users will be able to experience the pleasure of social responsibility rather than just pleasure from cleaning out their closets. The experience of being able to visualize their personal impact will also, in turn, educate the users on the environmental issues surrounding the textile industry. This kind of interactive consignment brand experience has not been done before. This project aims to examine

the success and viability of the SECOND brand business model and interactive donation experience.

The Competitive Landscape

The competitive landscape can be examined in three separate approaches: fast fashion or big retail brands implementing eco-friendly features in their existing business models, online consignment brands that accept donations from consumers, and nonprofit organizations that sell second-hand clothing.

The first approach is fast fashion and big retail brands that are already implementing eco-friendly features into their existing business models. As global textile consumption grows and consumer awareness surrounding ethical practices increases, many fashion companies are beginning to recognize the importance of sustainability in their business approach and have begun to incorporate green practices into their supply chains (Shen, 2014, p. 6237). Examples of these fashion companies include H&M, Levi Strauss & Co., Uniqlo, and Patagonia. The most notable company is H&M since throughout the years, H&M has implemented green practices in various stages of their production and consumption cycles. H&M actively uses organic cotton that is grown without pesticides and synthetic fertilizers, in addition to, supporting and investing in sustainable cotton production. A move towards utilizing sustainably grown resources helps improve the management of water resources throughout the textile production cycle (Shen, 2014, p. 6240). H&M also aims at sending zero waste from their organization to landfills. They have introduced recycled materials into their product lines which include the use of recycled polyester, polyamide, plastic, and wool. Lastly, H&M has launched an

old garment collection program within their retail stores. This program allows customers to drop off their unwanted or unwearable garments in stores in exchange for a coupon or discount incentive.

The second competitor approach is online consignment brands that sell second-hand garments collected from customer. The “re-commerce” business model is relatively new in the e-commerce world and reflects the business model of SECOND the most. There are two types of re-commerce approaches: brands that rely on customer donations for inventory and online platforms that allow users to sell and profit from their own used clothing. For the first approach, brands like ThredUp have built its business by initially selling used clothing from big retailers. As they have grown, ThredUp has expanded their approach and has adopted a new program called Resale-As-A-Service (RAAS). This service allows customers to trade in their unwanted clothes for merchandise credit. This option might be more convenient to some consumers who want something in return for their clothing but do not want to go through the effort of trying to sell their garments themselves. However, this service is also flawed since ThredUp has said it generally accepts about half the items it receives and sends the rest to recycling programs. Thus, there are still hundreds of pounds of clothing diverted out of the reuse and repair cycle. The second approach allows for consumers to utilize online platforms like Depop or Ebay to sell their own garments and keep a majority of the profits. While this type of re-commerce approach is utilized by many due to the appeal of choosing their own prices, there are still limitations that prevent it from being mainstream. The biggest limitation is the lack of convenience. This approach requires users to list their own products, package

them, and ship their products themselves. The convenience issue is what makes the first approach like ThredUp more popular.

The third competitor approach is nonprofit organizations that sell second-hand clothing. The most well-known organization in this category is Goodwill. A common misconception many users have regarding nonprofit donations is that the clothes they donate will be resold or will benefit someone in need. However, only a small percentage of donated clothing is actually resold in stores. The surplus clothes that cannot be sold in stores is bundled up and shipped to third-world countries or is sold to textile graders (or rag dealers). The rest will eventually be discarded into landfills (Hawley, 2014, p. 212). The process of shipping bundles of second-hand textiles to third-world countries further damages and hinders those countries' economies and textile industries. On the other hand, textile graders will purchase the surplus for pennies on the pound and will take the textiles to be recycled. The issue with this process is that clothes have to meet specific requirements to be able to be recycled. The textiles that do not meet these requirements are then discarded into landfills. The nonprofit second-hand consignment business does aid in diverting post-consumer textile waste to an extent, however, the business model still allows for hundreds of pounds of textiles to be sent to landfills in the end.

Proposed Circular Business Model

The implementation of a circular economy business model in the fashion industry relies on five different sectors (see Figure 3). The first sector is the use of organic and recycled material in the pre-manufacturing stage to ensure the textile can be easily recycled with today's current recycling technologies. To further emphasize the green

practices in this sector, sustainable and ethically grown sources should be considered.

The second sector is an eco-friendly production method which focuses on reducing pre-consumer waste of textiles and resources such as heat and water. The third sector is ensuring fair-wage/trade working conditions. Today's fashion industry relies heavily on the use of sweatshops and other exploitative labor methods to maximize profitability. A true sustainable and circular business model should emphasize ethical working conditions in the production and trade stages. The fourth sector is a guilt-free user experience. If the other three sectors are successfully implemented, the fourth sector should consequently follow. The fourth sector also emphasizes building a positive customer relationship through offering quality and affordable products. The final sector is responsible product management and disposal. This sector relies on both company and consumer accountability. Companies should implement procedures for proper textile disposal measures as well as include consumer education tactics to properly inform consumers on proper disposal methods.

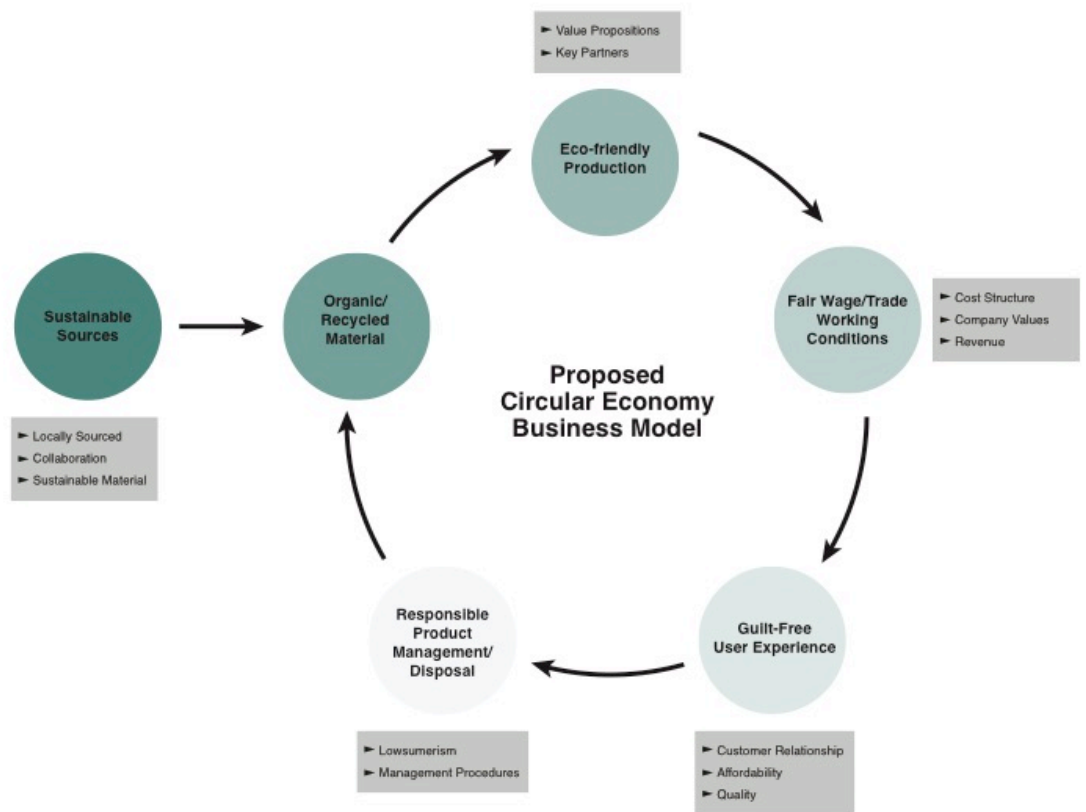


Figure 3. Proposed Circular Economy Business Model (Chang, 2020).

The proposed circular business model of SECOND relies on the ideas of reuse and repair, rather than recycle or remanufacture. The goal of the SECOND brand is to compete with big fast fashion brands as well as other online retailers marketing second-hand clothing. Therefore, the business model of SECOND depends on user experience and interaction with the brand from the point of drop-off to the point of consumption. A

user flow map was made in Figure 4 to explain the user and product flow between these two points of interaction.

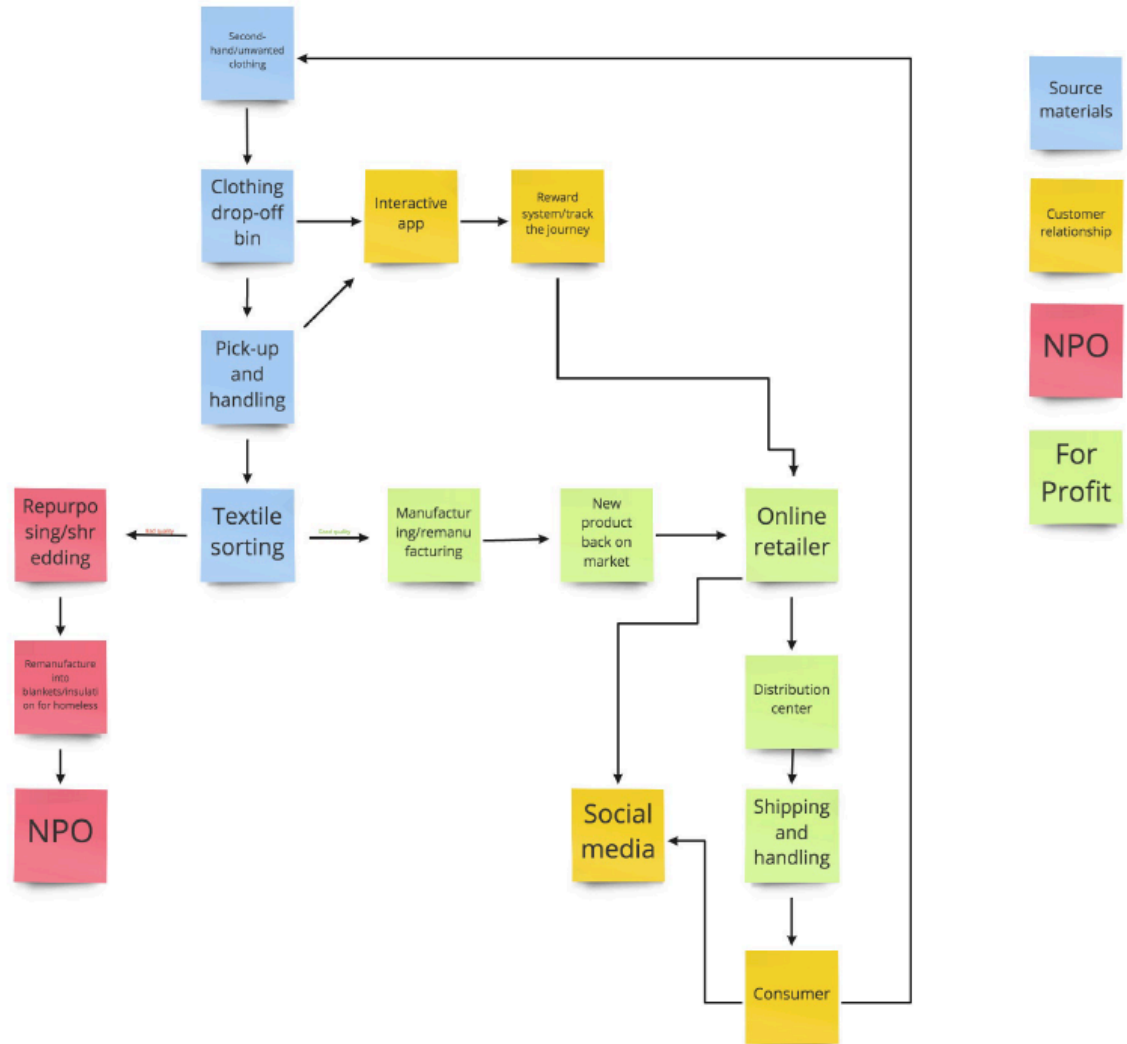


Figure 4. SECOND Brand User Flow Map (Chang, 2020).

Design Process and Strategy

The design process can be divided into five different stages. For this project, the design process will follow the Design Thinking model proposed by the Hasso-Plattner Institute of Design at Stanford (d.school). The Design Thinking process proposed by

d.school focuses on understanding human needs by reframing the problem in human-centric ways. These five stages of Design Thinking include: Empathize, Define, Ideate, Prototype and Test (see Figure 5).

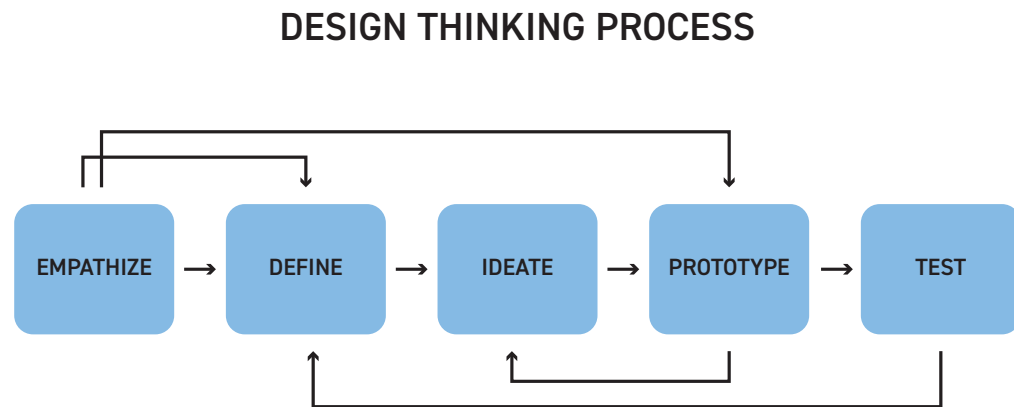


Figure 5. Five Stage Design Thinking Process (Chang, 2020).

The first stage of Design Thinking is to acquire empathic understanding of the problem the project is trying to address. The empathy stage is also regarded as the research stage. This stage involves primary and secondary research. Primary research requires direct engagement with the users to understand their experiences and motivations to gain a deeper understanding of the issues. In this stage, surveys and interviews were conducted within the local community to identify consumer behaviors and lifestyle choices. Secondary research requires designers to research the issues through previously conducted studies. From this stage, a clear understanding of the users, their needs, and the problems in the community were identified and confirmed. Once

these factors are identified, the second stage of the Design Thinking process is introduced.

The second stage of Design Thinking is to define the problem. During the define stage, the information and research that was gathered in the previous stage is put to use to define the core problem. Once the core problem is identified, a problem statement in a human-centered approach is defined. The define stage will help establish the features, functions, and elements of design that will be implemented into the final product to fit the users needs effectively. The problem statement for this project has been identified as: “A convenient textile disposal method needs to be developed that promotes reusing textiles to keep resources within the economic loop.”

The third stage of Design Thinking is to generate ideas by asking questions that can help identify solutions to the problem statement. During this ideation phase, several techniques such as brainstorming, word listing, and “How Might We” questions are used to narrow down solutions to find the best fit idea. It is essential to get as many ideas and solutions out during this phase as the process moves on to the fourth stage.

The fourth stage of Design Thinking is prototyping solutions to test the ideas so unsuccessful ideas can be eliminated and successful solutions can be fine-tuned. This is an experimental phase which aims to re-examine or reject features and functions based on user experience. The prototyping phase employs elements from all three stages before this stage and also allows back and forth reconsideration between the ideation and prototyping stage. More questions will naturally arise from this stage and will allow designers to backtrack to address issues that were not previously considered. By the end

of this stage, the designer will have a better idea of the present problem and have new insights on how real users would behave and feel when interacting with the final product.

The final stage of Design Thinking is testing the complete product using the best solutions found in the prototyping phase. This is the final stage and leads to the final product, however, alterations and refinements can still be made during this phase to truly gain a deep understanding of the product and users. It is also important to consider the non-linear nature of design thinking. Often, one stage will lead to another in a flexible non-linear fashion. Therefore, the final stage is not always the final solution. The five stage Design Thinking process is still systematized and allows for flexibility and creativity in its approach to human-centered problems.

Brand Development

The Design Thinking process is needed when developing a brand's identity. In the first stage of the process, primary and secondary research was conducted to investigate the users' needs and wants. A survey of eighty-eight participants was conducted to examine the community's lifestyle and disposal habits. The results of the survey showed that a majority of the participants shop from fast fashion brands. These same participants noted that affordability and trendy clothes were the top contributing factors in choosing which brands to shop from. Keeping these factors in mind, the brand goals should aim to provide the users with these factors and develop a unique selling proposition to distinguish themselves from competitors. A unique selling proposition (USP) refers to a unique benefit provided by a company, product, or brand that highlights it from competitors (Maklan & Knox, 1997, p. 121). These benefits should be meaningful and

human-centric, keeping the target users in mind. When examining the brand structure of SECOND, the unique selling proposition lies within the interaction experience of donating clothing to the automated textile drop-off bins. To compete with today's top brands, SECOND will need to distinguish and separate itself in both the fast fashion realm as well as the second-hand re-commerce realm.

Moving on to the second stage of Design Thinking, defining SECOND's mission statement is integral to making further design decisions. After assessing the target market and the competitive landscape, SECOND's mission is to provide trendy apparel as a sustainable, convenient, and affordable alternative to fast fashion. The mission statement will be the basis upon which the ideate and prototyping phases are based on.

In the next stage, sketches and possible design choices are considered and tested on users. The foundational questions are laid out and the logo design, color choices, and typography choices are considered based upon these questions. These questions include: Who is the target audience? What are the wants and needs of the target audience? How will the brand satisfy these wants and needs? In Figure 6 below, the first draft of the

brand identity was developed.

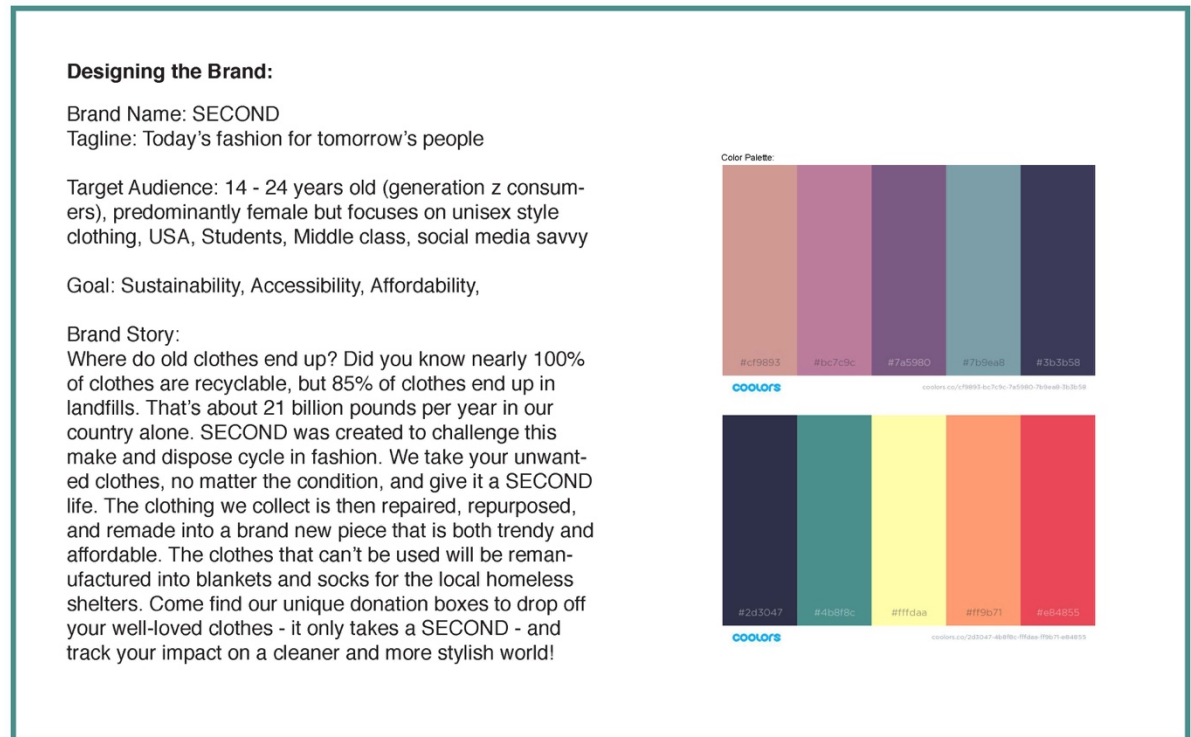


Figure 6. Brand Identity Draft (Chang, 2020).

The initial logo sketches and color options were then user tested on a group of twenty participants. The user testing provided insight on unsuccessful color palettes and logo variations. The participants noted that the color palettes presented were too muted and did not relate to the brand's eco-friendly message. They also suggested the initial logo sketches did not feel youthful enough for the target audience. After revisiting the ideate

and testing stages, the final brand identity was created (Figure 7-17).

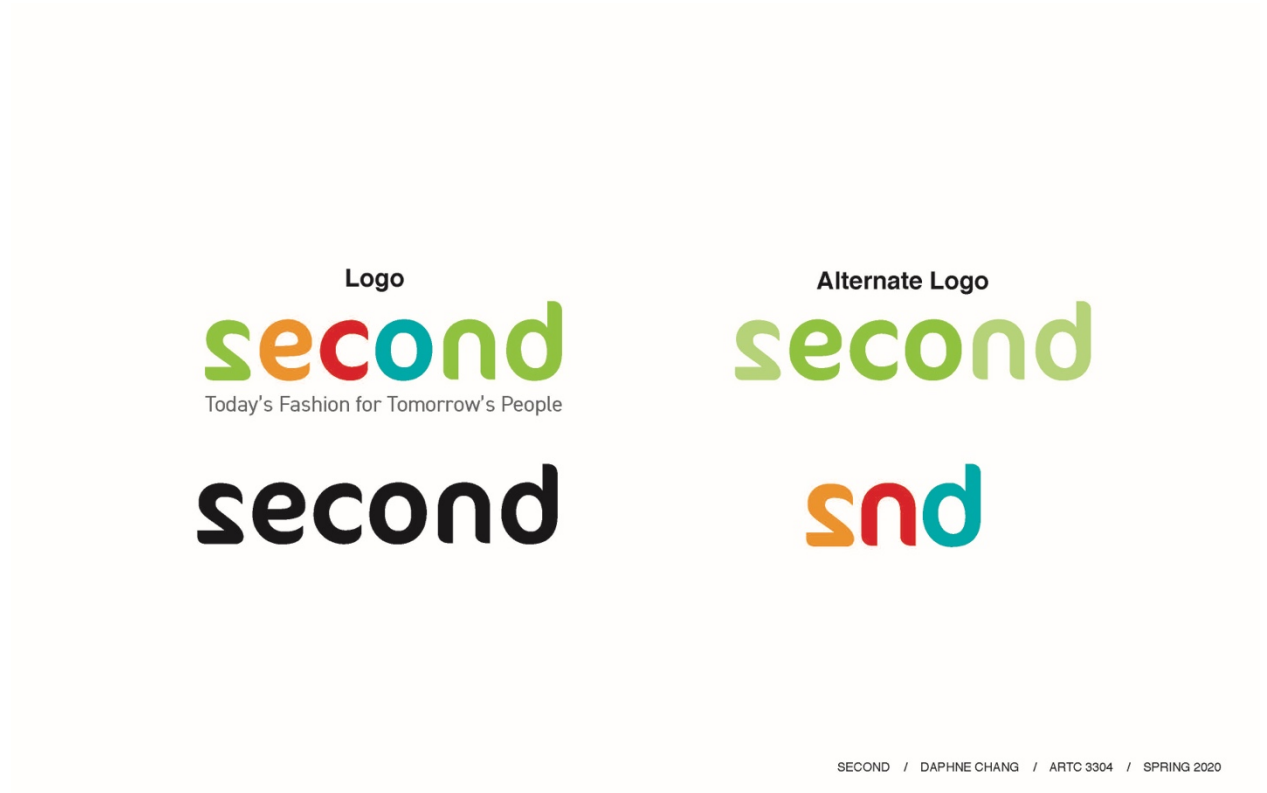


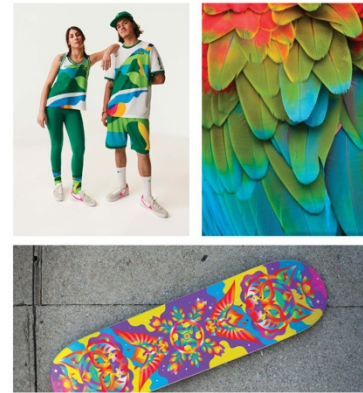


Figure 7. second logo and alternate logo (Chang, 2020).

Color Palette

				
#99ca3c PANTONE 382 U	#f99b1c PANTONE 7408 U	#ed1c24 PANTONE 185 U	#00b4b8 PANTONE 7466 U	#808285 PANTONE Cool Gray 10 U
C: 45 M: 0 Y: 100 K: 0	C: 0 M: 46 Y: 100 K: 0	C: 0 M: 100 Y: 100 K: 0	C: 84 M: 0 Y: 33 K: 0	C: 0 M: 0 Y: 0 K: 60
R: 153 G: 202 B: 60	R: 249 G: 155 B: 28	R: 237 G: 28 B: 36	R: 0 G: 180 B: 184	R: 128 G: 130 B: 133

Color Inspiration



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Figure 8. Color Palette and Inspiration (Chang, 2020)

Typography

CoconPro Regular

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

DIN 2014 Regular

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

SECOND / DAPHNE CHANG / ARTC 3304 / SPRING 2020

Figure 9. Primary and Secondary Typography (Chang, 2020)

Stationery



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Figure 10. *second Stationery Front and Back (Chang, 2020).*

Touchpoints



Clothing Tags

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Figure 11. *second Clothing Tags (Chang, 2020).*



Shipping Box

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Figure 12. second Shipping Box (Chang, 2020).



Tshirts and Tote

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Figure 13. second T-shirts and Tote Bag (Chang, 2020).



Donation Box



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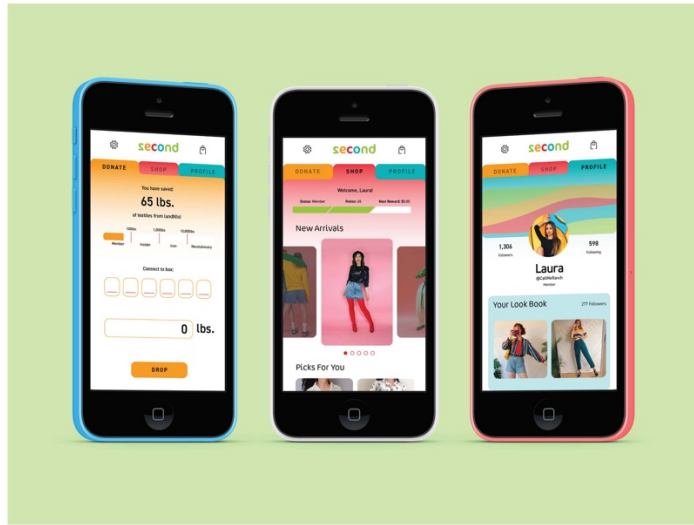
Figure 14. second Donation Box and Photoshop Mockup (Chang, 2020).



Pick-up Van

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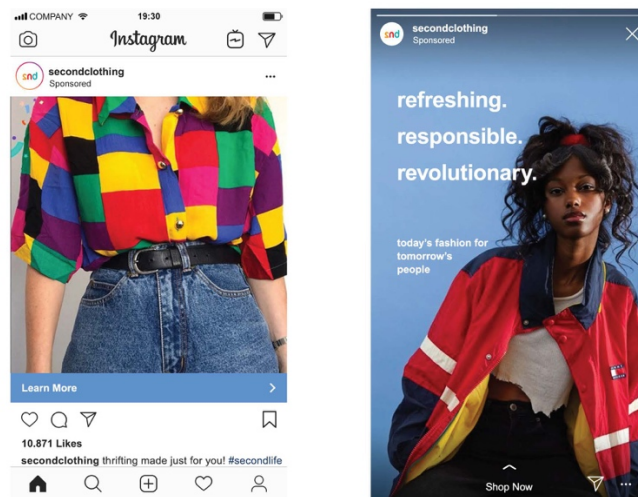
Figure 15. second Pick-up Van (Chang, 2020).



Re-commerce App

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Figure 16. *second App Design (Chang, 2020).*



Instagram Ads

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Figure 17. *second Instagram Ads (Chang, 2020).*

Donation Box Redesign

The donation box plays the most integral role within the SECOND brand identity. The donation box is the brand's unique selling proposition, as well as the user's first point of interaction with the brand. Several factors of the donation box redesign need to be considered with the end user in mind. Textile donation boxes that are currently being used are outdated, inconvenient, and are designed purely for function without consideration of the users. Results of the survey found that most of the participants in the community dispose of their clothing through donating to nonprofit organizations directly. Less than 15% of participants reported utilizing the textile drop-off containers found throughout the community in parking lots. However, what many people don't know is where exactly their clothing goes and what organization they are supporting when using these drop-off containers. As previously noted, in both donation methods, only a small percentage of clothing is actually reused or successfully recycled. Through follow up interviews, interviewees placed the importance of convenience as one of the top contributing factors in using these disposal methods. Users are able to drive through and drop off their clothing easily. However, when asked whether placing textile drop-off bins at storefronts alongside plastic bag recycling receptacles would make them more inclined to utilize donation boxes, interviewees had a positive response towards this idea. Another contributing factor is the physical outward appearance and design of these boxes. Current boxes are designed with anti-theft measures since they are placed outdoors in parking lots. Most of these boxes also only utilize a single color and minimal text explaining the purpose or organization the box is a part of. These factors cause the current donation boxes to appear unappealing and unapproachable. The SECOND donation boxes will be

placed in front of grocery stores, department stores, and shopping malls. This choice will encourage an ease of access and donation process, eliminating the need for anti-theft mechanisms and will allow for more creative liberties since they will be indoors.

Interviewees also expressed four main factors that would draw their attention to textile donation bins: Bright colors on the exterior design, signs showcasing the brand's clothing, being able to interact with the bin via smartphone app, and money or discount incentives. The main takeaways from the survey and interviews lead to the final donation box design shown in Figure 14.

The exterior of the box was designed to gain attention, appear more approachable, and increase accessibility. The interior of the box aims to implement modern technology to appeal more to a new generation of tech-savvy consumers. The doors at the top of the box will be equipped with a weight scale and an ESP32, a chip microcontroller with integrated Wi-Fi and Bluetooth capabilities (Figure 18). The doors will be controlled using a magnetic closure linked to the ESP32. Once the clothing is placed on the scale doors, users will be able to connect to the box via the SECOND app to trigger the doors to drop the textiles into the box. The weight will be recorded and added to the user's app profile. Users will be able to earn discount incentives per poundage of textiles donated to use on their next purchase. This function allows for an interactive experience, customer loyalty, and an incentive to continue donating clothing through this method.

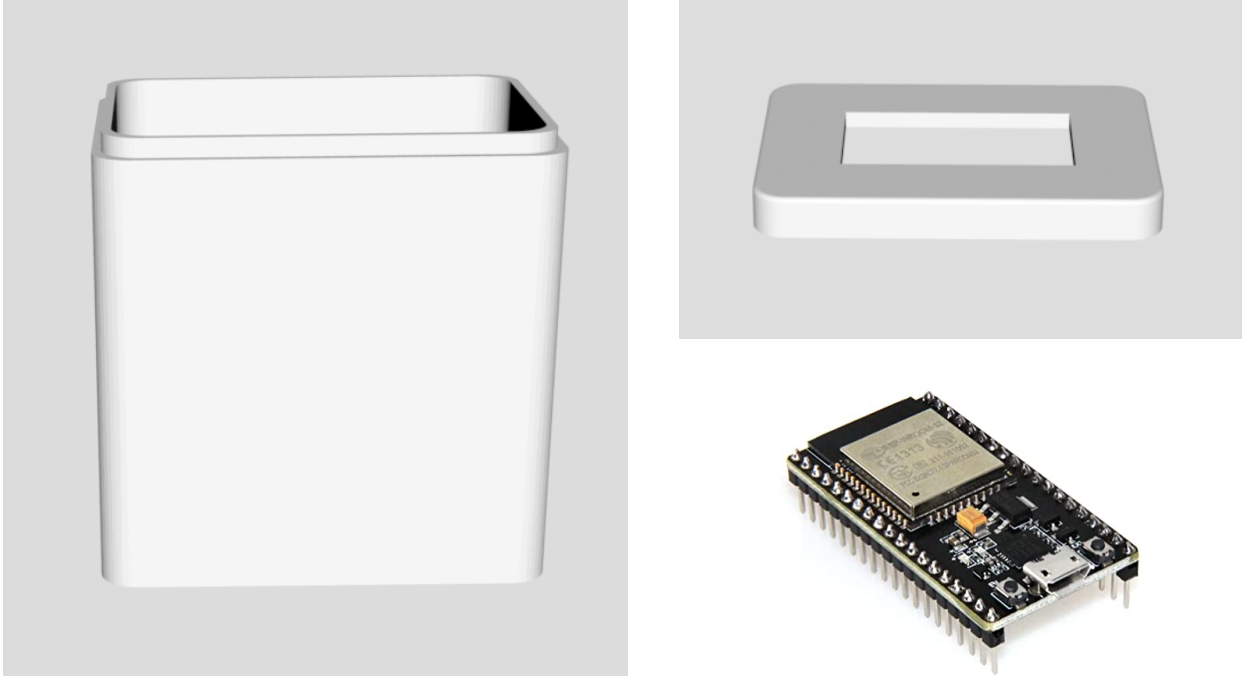


Figure 18. Box Base, Lid, and ESP 32 (Chang 2020).

Developing the Mobile App and User Interface

The mobile app will feature three main screens (see Figure 19). The main screen will bring users to the shop page where users will be able to browse newly added items and a personalized feed showcasing clothing in the styles they wear. In the interviews, interviewees expressed that they would like more filtering options in an online thrift store platform. This preference is largely due to the fact that traditional in-store thrift shopping is time consuming due to need to search for specific articles of clothing that appeals to the consumers. By being able to filter options and personally curate what styles your feed shows, users will be able to shop more conveniently without the hassles presented with in-store thrift shopping.

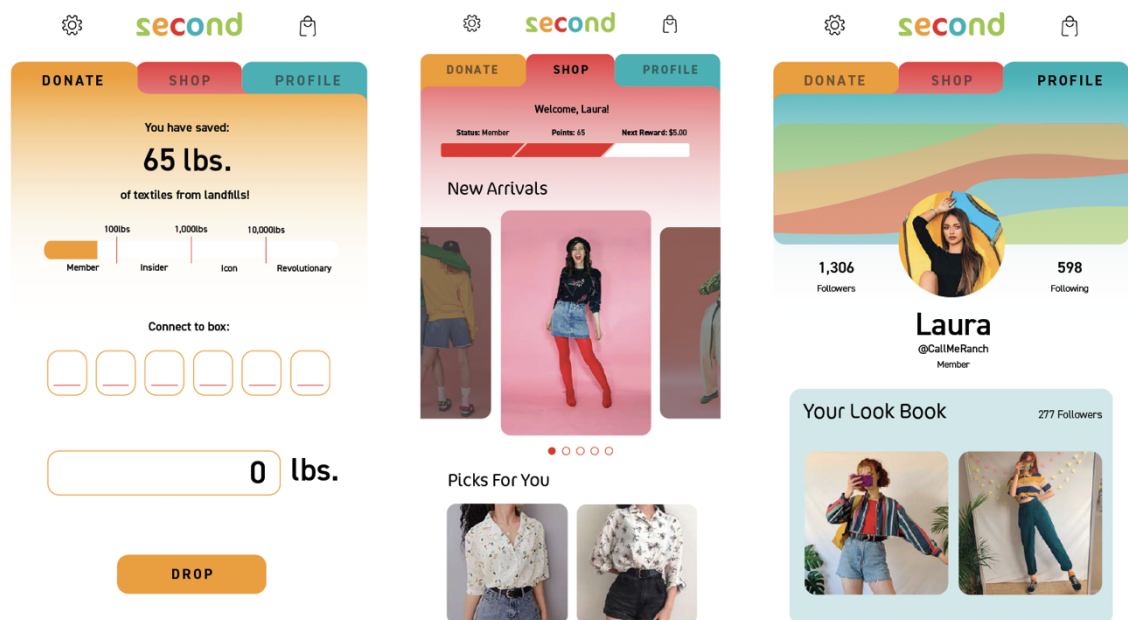


Figure 19. Three Main App Screens (Chang, 2020).

The second screen will bring users to the donate page where users will be able to connect to SECOND donation boxes to donate their clothing. The donate page will track the user's personal textile contributions in a four-tiered system. As users donate more clothing, their status increases along with their rewards and discount incentives. Through this page, users can connect to donation boxes through a unique six-digit code found on each box. At the bottom of the screen, once the user confirms the correct weight of textiles, they can trigger the doors to open and drop the clothing into the box.

The third screen will be the user's profile page. On this page, users can customize their profile like a social media profile. The survey conducted in the first Design Thinking stage found that users are more inclined to continue using an e-commerce app if it had social media features such as followers, comments, and picture reviews. These

features were integrated into the profile page of the app. Users will be able to follow other profiles and gain followers. On their profiles, they can create customized look books from the clothing they bought from the app and leave reviews on the products. This function will not only aid in creating trust with consumers, but it will also allow users to express themselves through exhibiting their personal style.

Prototyping

As a designer, it is important to test ideas in every stage of the design process. The prototyping stage is especially important when designing interactive systems. Buchenau and Suri (2000) stated that, “Prototypes are representations of a design made before final artifacts exist” (p. 424). In this stage, digital mockups of the donation box and app were developed and user tested with members of the community. In the initial prototyping phase, fifty users were observed in how they interacted with the prototype’s features and design elements. The feedback received provided insight on revisions to make to the design. Prototyping participants also provided suggestions on features they would like implemented within an online retail interface. A majority of participants seek easy navigation, easy customer service communication, and detailed filtering options. These features were considered and implemented into the final design.

After several rounds of user testing, a final prototype was created from 3D printing technology. The final prototype was then user tested on the community. A follow up survey with eighty-seven participants was conducted at the end of test to receive feedback on the success and viability of the concept and design. A majority of the

participants reacted positively towards the final prototype. Results of the survey included (Figure 20 – 22):

If textile drop-off bins were placed in locations with plastic bag recycling receptacles, such as at the entrance of grocery stores, departmen... more inclined to dispose of clothes this way?
87 responses

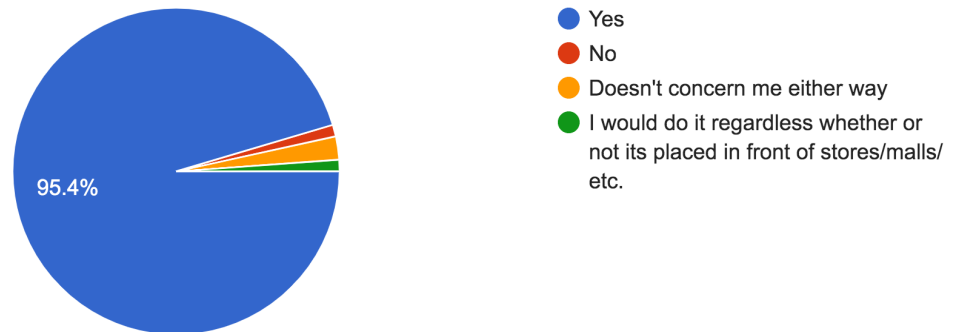


Figure 20. Survey Results 1 (Chang, 2020).

If you were able to see and track your personal contributions, such as "you have saved 200 lbs of textiles from landfills", would you be more encouraged to keep contributing more?
87 responses

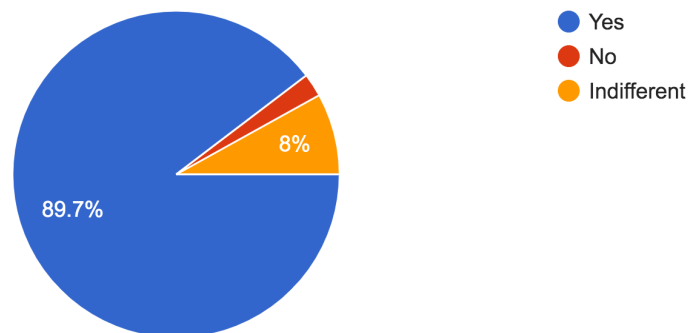


Figure 21. Survey Results 2 (Chang, 2020).

If you were offered a discount incentive per __ amount of clothes donated, would you feel more encouraged to continue shopping from the brand?

87 responses

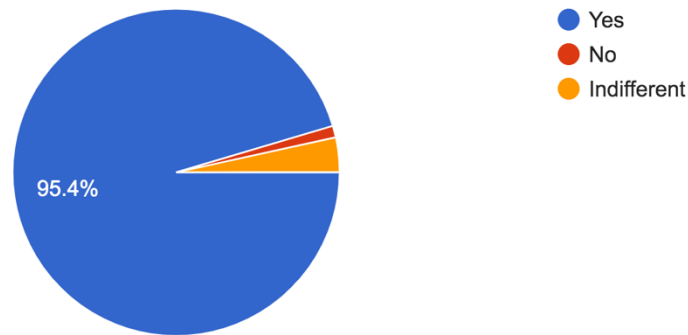


Figure 22. Survey Result 3 (Chang 2020).

CHAPTER 5: CONCLUSION

Analyzing the Viability of a Circular Economy

The purpose of this project was to measure and conceptualize the viability of a circular economy in the fashion industry. The prototyping experiment resulted in positive feedback and support of the project. Approximately 90% of participants that took part in the final stages of prototyping wished for further development on this project to become a real brand. Therefore, the first level of a circular economy, designing for longevity, was indicated to be achievable by inspiring and changing consumer behavior. 92% of survey and testing participants reported to be within the ages of 16 to 25 and 95% of the participants within this age range reported that they would prefer this method of disposal

over the current textile drop-off bins. By educating consumers about proper textile disposal methods through an interactive experience and retail brand, younger consumers are more inclined to participate.

Future Research

Further development of the donation box and app interface can include more aspects of circular design. By developing a universal weight scale lid component, the lid can be fitted to any container. Thus, any repurposed container can become a SECOND donation bin to further promote the circular design approach. On the other hand, further testing of the app can be explored to include a wider range of consumer demographics. These demographics include older generations and an international market. With the further development of the donation box and app, further research can be conducted to test how SECOND can compete against big retailer brands and nonprofit organizations.

The SECOND project focused on a circular economy in the fashion and textile industry. Using this model, a circular economy can be theorized in other sectors such as the construction, automotive, agriculture, furniture, or oil industry. Circular economy and circular design are relatively new concepts and have recently begun to gain attention. This project leaves potential to develop a sustainable framework for implementing a circular economy in the United States.

Summary and Conclusion

Fast fashion and improper textile disposal has contributed to growing environmental concerns. The current make-and-dispose model of the fashion industry

encourages high consumption levels and even higher waste levels. Adopting a circular economy model is integral in the fight towards sustainability. Without proper textile recycling and disposal infrastructure put in place, the responsibility falls upon the consumers to reexamine their consumption habits. The next generation of consumers differ from their predecessors in their shopping methods and spending habits. Generation Z consumers are gaining ethical awareness as well as an increase in online and mobile shopping methods. Adopting a circular model in the fast fashion industry relies on designing for the end user in mind: Generation Z and Millennial consumers. Using the Human-Centered Design and Design Thinking processes, a circular brand experience was prototyped in the local community.

By testing and prototyping the SECOND project in the local community, it was indicated that a re-commerce brand concept is a viable option within the fashion retail industry. The re-commerce concept and circular economy model are on the rise. These concepts are projected to grow within the next several years as the next generation of consumers become more environmentally aware and begin changing their consumption habits. The inclusion of experience design within both the retail and recycling business has not been utilized before. Therefore, including experience design and consideration of the end user within the retail industry provides companies opportunities to connect with their customers on a more intimate level. The SECOND brand experience that was prototyped in this thesis could further be developed and created into a real brand experience. Aspects of the SECOND brand concept can be adopted into existing retail brands to lessen the environmental impact of the fashion and textile industry.

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