

DEVELOPING ENVIRONMENTALLY SUSTAINABLE APPAREL THROUGH
PARTICIPATORY DESIGN

by

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Abstract

Many sustainable garments do not engage wide consumer interest, nor encourage eco-conscious purchasing. Meanwhile, mass consumption of unsustainable apparel contributes to environmental degradation (Black, 2008). However, Niinimäki (2010) suggests that engaging consumers in the design and development of environmentally sustainable products could improve the balance between environmental design decisions and functional, aesthetic, and emotional qualities (Lamb & Kallal, 1992).

The purpose of this practice-based research was to (a) identify apparel and environmental attitudes and consumption behaviors of potential sustainable apparel consumers, (b) generate sustainable apparel design concept and product through use of participatory design methods, and (c) evaluate the sustainable concept, product, and participatory method. The sample was 10 female university students.

Consumer data was collected through an online (i.e., Facebook) ethnographic journal and a focus group. Qualitative analysis generated the target market's ideal apparel characteristics and ideal environmental apparel characteristics as apparel offering versatility and variety within their existing wardrobes; elements expressive of their personalities; simple and inexpensive maintenance; organic or recycled materials; and less textile waste at disposal. Additionally, it was determined that participants had low knowledge of the apparel and textile industry and its environmental impacts.

Generation of sustainable apparel design ideas occurred through a second focus group session. Analysis of the focus group data, combined with the researcher's tacit sustainable design knowledge, formed a design concept. The sustainable apparel design concept was comprised of three characteristics reflective of the target market's ideals and design suggestions: be versatile through various temperatures; social settings, and environments; be convertible through temporary adjustment of functional and aesthetic elements; and be transitional allowing the garment to be layered for greater thermal insulation without detracting from the appearance. The sustainable apparel concept was an application of the pre-existing Design for User Interaction sustainable design strategy.

The sustainable apparel design concept was then applied to the development of an outerwear garment and presented to the participants and mentors as a digital sketch. The design addressed the sustainable design concept through interchangeable envelope-style shell layers, an insertable thermal core layer, a buttoned closure at the hemline and interconnecting button points for added alignment between layers. In this garment, the researcher applied participants' suggestions of style, materials, and inclusion of a core layer. Following sketch refinement, two prototypes were constructed. The first prototype consisted of a thermal core layer and outer coat layer. Due to challenges with the core layer fabric, the second prototype modified the core layer material and style. Additionally, in the second prototype, the shell was made sleeveless and both a bolero style jacket and lining were added. Dual button fasteners connected the layers.

During the third focus group session, participants evaluated the design concept, second garment prototype, and the participatory design methods. Participants noted that the design concept provided increased ease of garment care (which could potentially increase the frequency of laundering); ease of garment storage; and increased versatility through varying temperatures. Participants' suggestions for prototype refinement included the addition of a kick-pleat and reduction of button alignment points.

Prototype development did not reach completion during this study. Further refinement of the garment's pattern and fit, implementation of additional aesthetic/functional elements, and development of an intuitive transformation are necessary. Participant evaluation of participatory methods and study participation were the use of Facebook as an online ethnographic journal made daily participation easy and allowed the researcher to become familiar with their personalities, increasing their comfort at later stages of the research. Participants felt their suggestions were evident in the garment prototype and were as involved as their experience and knowledge allowed. The only participant suggestion regarding the participatory design experience was the addition of updates informing participants of the design progress between focus group sessions. Though the concept and resulting garment were not exceedingly original, participants were pleased with the fruition of their ideas. This finding indicates a willingness to participate in the design process, supportive of participatory design.

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Dedication

For my Grandparents,

Floyd Earl Hangen

(October 13, 1930 - April 3, 2010)

Ruth Ann (Weber) Hangen

(September 17, 1934 - March 24, 2013)

Chapter 1 - Introduction

Background of the Study

Mass consumption of environmentally unsustainable products has reached alarming rates and is a driving force behind global climate change and environmental degradation (Black, 2008; Fletcher & Grose, 2012; Gwilt & Rissanen, 2011). Thus, the environmental impact of textile and apparel production, consumers' acquisition and care, as well as disposal patterns, has recently become a major topic of discussion relating to environmental sustainability within the academic, corporate, and consumer communities. Researchers propose that a consumer driven "green" revolution could lead to a more successful societal shift towards environmentally conscious consumerism (Chapman, 2005; Fletcher, 2008; Fletcher & Grose, 2012).

However, apparel consumers have yet to be compelled on a large scale to assist in reducing the environmental impact of apparel through an active strategy (Chapman, 2005). For example, studies show that consumers who consider themselves to be environmentally conscious are likely to recycle typical household waste (a passive post-use strategy), but are less likely to purchase apparel items that are considered to be more environmentally preferable such as organics or second-hand clothes on a regular basis (an active strategy) (Hiller Connell, 2010). This disparity is often examined from a marketing perspective regarding consumer behavior and frequently the results show that the consumers' willingness to purchase relates to attributes of design and product development (Ha-Brookshire & Norum, 2011). Additionally, consumer research suggests that most consumers have not been educated on the environmental impacts of the apparel industry (Dickson, 2000). Thus, environmentally conscious decision-making is not a

priority among most consumers when exhibiting apparel purchase behavior (Gam, 2011; Meyer, 2001). However, researchers (Gam, 2011; Niinimäki, 2010) propose that engaging potential sustainable apparel consumers (SAC) with environmentally conscious product design is likely to ensure a better balance between environmentally preferable design decisions and basic consumer preferences for apparel with functional, aesthetic, and emotional qualities (Lamb & Kallal, 1992).

Numerous sustainable design strategies are being developed and evaluated for effectiveness at all levels of the apparel industry, from independent design companies to major corporate brands (Hanes Brand, 2013; Chanin, 2010; Patagonia, 2013; Prastakou, 2013; Roberts, 2013). Meanwhile, scholars have sought to evaluate common corporate strategies, such as the use of environmentally preferred materials (Gam, Cao, Farr, & Kang, 2010; Ha-Brookshire & Norum, 2011; Hustvedt & Bernard, 2008). Still other scholars have sought to apply and advance innovative, small-scale strategies encouraging more effective and advanced design solutions (Gam, Cao, Farr, & Heine, 2009; Young, Jirousek, & Ashdown, 2004); for example the development of design for disassembly in apparel items by Gam, Cao, Bennett, Helmkamp, and Farr (2011). Further development and application of many of these design studies have stalled due to the lack of consumer interest, feedback, or participation (Gam et al., 2011).

A potential strategy to engage consumer interest in sustainable apparel products could be to include consumers in the design process through participatory design. Participatory design methods involve members of the target market in the design process, in order to inspire design decisions. The designer gains an empathetic relationship to potential consumers, allowing insight into the consumer's fundamental psychological orientations, attitudes, behaviors, and needs. Through collection and interpretation, these mental and emotional attributes can inform

designers to achieve a sustainable design that will engage consumers through layers of meaning and experience (Chapman, 2005).

Apparel designers have the opportunity to influence the direction of a garment, collection, or even entire trends. Designing sustainable and purposeful apparel through a cooperative effort that employs consumer input may more effectively engage consumers in environmentally conscious decision-making (Black, 2008; Fletcher, 2008; Niinimäki, 2010; DeLong, 2009). Further, by utilizing sustainable design strategies and informed apparel lifecycle predictions (regarding the care, use and disposal of both materials and garments), a designer could inspire radical change in the apparel and textile industry to better address future natural resource depletions and other environmental issues (Black, 2008; Fletcher, 2008).

Statement of the Problem

Most current approaches to environmentally sustainable apparel available in the market, such as organic materials or redesigned apparel, do not engage the wider consumer interest nor encourage widespread eco-conscious purchase behavior. Sustainable design in combination with other influential aspects observed during purchase decisions, for example price and availability, have not led to a global adoption of environmentally sustainable apparel products. Yet, increased consumption of environmentally unsustainable products is driving global climate change and environmental degradation (Black, 2008; Fletcher & Grose, 2012; Gwilt & Rissanen, 2011). In the apparel and textile industry, traditional consumer research methods, such as survey instruments, are unable to reveal appropriate, progressive actions for environmental apparel designers to utilize for fulfillment of consumer's psychological motivations (Niinimäki, 2010). Research and design methods within apparel and textiles, have not adapted to the changing

marketplace and, therefore, cannot inform the advancement of sustainable design strategies and developments better suited to the product's modern interactive consumer (Chapman, 2005; Fuad-Luke, 2009; McDonough & Braungart, 2002; Sanders, 2008).

Purpose of the Study

The purpose of this study was to advance effective environmentally sustainable apparel design strategies and environmental apparel development through the utilization of participatory design methods. This purpose was further comprised of five primary objectives.

- The first objective was to identify the current apparel attitudes and consumption behaviors of young adults who are potential sustainable apparel consumers through the use of participatory focus groups and qualitative data collection methods.
- The second objective was to identify the current environmental attitudes and behaviors of young adults who are potential sustainable apparel consumers through the use of participatory focus groups and qualitative data collection methods.
- The third objective was to generate sustainable apparel design strategies based on the analysis of collected qualitative data.
- The fourth objective was to design and develop an environmentally sustainable apparel product, by applying the participant generated and researcher refined environmentally sustainable apparel design concept.
- The fifth objective was to evaluate the application of the sustainable apparel design concept to the resulting apparel garment product to determine if it

effectively reflects the target markets' understanding of sustainable apparel and desired outcome.

- The sixth objective was to reflect on the utilization of participatory design methods within this study in order to explore its viability for future apparel design.

Significance of the Study

This study is of current significance. The earth is at the tipping point where the effects of global warming are nearly irreversible and the apparel and textile industry is a major contributor to environmental degradation (Black, 2008; Brown, 2010; Chestney, 2012). Engaging the apparel consumer as an active stakeholder in a search for the solution to reduce the environmental impact of the apparel industry is necessary. Apparel consumer research indicates consumers desire a more conscious balance of environmental and traditional design attributes (Niinimäki, 2010). Designers and product developers have the opportunity to create revolutionary ideas, but consumers do not always well receive these ideas. Through the addition of consumer research data collected through participatory design methods, the designer can develop empathetic, innovative, and environmentally sustainable design that both reflects the consumer's input, as well as engages the consumer in a meaningful product relationship (Chapman, 2005).

Additionally, this research implements participatory design methods that are less common than traditional design research methods within the creative apparel design discipline. Advancing literature on design methods in apparel and textiles will lead to a more substantiated

apparel and textile design discipline, necessary for the development of advanced degree programs.

The information revealed in this study regarding potential SACs, and the use of participatory design methods within apparel design could advance knowledge in both the general apparel and specifically the apparel design disciplines. Additionally, dissemination of the findings and product outcomes could lead to innovative strategies to reduce the environmental impact of the apparel and textile industry through education of emerging apparel designers.

The Researcher's Tacit Knowledge

Throughout the study, the researcher applied her own tacit knowledge; thus, a short summary of the researcher's experience is necessary. The primary researcher received a Bachelor of Fine Arts degree in Textile Design from an accredited four-year university in the United States, with a minor in History of Art. Additional educational training regarding the design process, design research, and research methods was achieved at a second four-year university in the United States for partial fulfillment of a Master's of Science degree in Apparel and Textiles. Furthermore, the researcher has over five years of professional experience related to apparel, textiles, and accessory design. In addition to educational and professional experience, the researcher has exhibited numerous works of art and design scholarship and has received awards and scholarships for her work.

Definitions of Terms

Contextual review – “An expansion of the term ‘literature review’ to acknowledge a range of contextual materials in the public domain, which are not simply text based or ‘published’ in the orthodox sense, for example images, art/design objects, websites,

video/film, performance, documented conversations/events, etc. These types of ‘public output’ must be referenced in some way, in order for them to be traceable and usable by others” (Gray & Malins, 2004, p. 198).

Core values – Abstract influences that are central to an individual’s self-concept. These items, concepts, or situations are highly considered and influential in decision-making; thus guiding consumers’ attitudes and principles of behavior.

Environmental apparel –Fashion that is designed and produced with consideration to environmental impacts throughout the apparel lifecycle.

Environmental impact –Any pollution of ground, air, or water through manufacturing, care, or waste generation; and depletion of non-renewable/unsustainable resources.

Focus groups – “A social science tool in which organized discussions, led by a moderator, are held in order to collect market research” (Visocky O’Grady & Visocky O’Grady, 2006, p. 185).

Formative research – “Research conducted at the beginning of a project to help define the problem to be solved” (Visocky O’Grady & Visocky O’Grady, 2006, p. 185).

Informed lifecycle predictions – Knowledge of intended use and future impacts of a material and garment throughout its manufacture, care, use, and disposal.

Iterative design – “A design process that uses a series of prototyping, testing, and refining cycles to reach a solution” (Visocky O’Grady & Visocky O’Grady, 2006, p. 185).

Participatory design – “A collaborative approach to the design of products, services, spaces or systems that involves actors/stakeholders in the design process” (Fuad-Luke, 2009, p. 21).

Practice-based research – Iterative original investigations to gain new knowledge in disciplines of physical interactions such as design.

Principles – A fundamental rule, moral code, underlying theory or belief that guides personal conduct or behavior.

Prototypes – Simplified and incomplete models of a design to explore ideas, elaborate requirements, refine specifications, and test functionality.

Reflective journal/research diary – “A journal/diary that the researcher keeps regularly in order to reflect on self-development, research methodology, and also on progress and change, for example in the development of an art/design work or process” (Gray & Malins, 2004, p. 203).

Social design approach – A broad category of design methods that involve users/stakeholders to varying degrees within the design process. Both participatory and user-centered design are methods of a social design approach.

Sustainable apparel design concept – A combination of sustainable apparel design ideas employed to guide the development of a sustainable apparel product.

Sustainable apparel design strategy – Strategic plans and methods to design apparel products through which negative environmental impacts are lessened or eliminated.

Systems approach – A broad approach to the problem, seeing things in terms of how they relate to each other as a whole rather than accepting narrow problem criteria.

Target market – The group or segment to which a product, system or communication is being directed.

User-centered design – Design that focuses on the needs of the users and involves those needs in the design process, also known as human-centered design.

Organization of the Study

The research described in this thesis is presented in eight chapters. The current chapter, Chapter 1, included the background of the study, discussion of eco-conscious design, statement of the problem, purpose of the study, significance of the study, and definitions of terms.

Chapter 2 presents a review of the context and literature including the environmental impact of the apparel and textile industry, strategies of sustainable apparel design, and current consumers of sustainable apparel.

Chapter 3 describes the methodological approach used in this research study, which is practice-based design research influenced through experiential learning and constructivism. Next, is an introduction to the social design approach and participatory design methods. Followed by discussion of design process models including the influence of the consumer needs model to prior models and this study. Concluding this chapter is the researcher's initial design research process model.

Chapter 4, the methods section, presents discussion regarding the population of interest, Millennials, and then proceeds to describe the research sample. Described within are the statement on the use of human subjects, the sample recruitment strategies, sample requirements and information, and incentives. Next, the chapter proceeds to the methods of data collection and analysis, including the online digital ethnographic journal, and three focus groups.

Chapter 5 begins the presentation of data analysis with research objectives One and Two. The chapter begins with an introduction to the research participants. The chapter then proceeds to discussion of research objective one, including participant attitudes towards apparel, the significance of apparel, apparel acquisition behavior and motivators, apparel care repair and

storage, and apparel disposal. Concluding the discussion of objective one is the target market's ideal apparel characteristics. The subsequent discussion relates to research objective two, including participants' eco-conscious knowledge and practices, and participants' knowledge of the apparel industry and apparel sustainability. The final discussion of objective two is the target market's ideal environmental apparel characteristics, before the chapter concludes.

Chapter 6 presents data analysis of research objectives Three and Four. The chapter begins with discussion of research objective three, including conceptual development through participant ideation, and the researcher's reflections on the first focus group session. Objective four's discussion begins with researcher propelled design ideation and then proceeds to conceptual design refinement through sketch iterations and full-scale prototypes. The chapter concludes with researcher reflections.

Chapter 7 presents data analysis of research objectives Five and Six. The chapter begins with discussion of research objective five, including evaluation of the environmentally sustainable apparel design concept and evaluation of the resulting apparel design. Following is discussion of research objective six, including participant reflections and researcher reflections on the participatory design methods.

Chapter 8 concludes the research study, beginning with a summary of the research design and sample, discussion of the objectives and findings including a revised design research process model. Concluding the chapter is the significance of the study and future research, and limitations.

Additionally, included in this master's thesis are three appendices. Appendix A includes the sample recruitment and online data collection materials. Appendix B includes the data collection materials used during the first focus group session. Appendix C includes the data

collection materials used during the third focus group session. Appendix D includes a proceedings abstract for submission to a conference.

Chapter 2 - Contextual Review

The apparel and textile industry is a mega-system with some "mega" environmental impacts, including water pollution, massive amounts of physical waste, and un-sustainable energy consumption (Black, 2008; Fletcher, 2008). Within such a complex system, it is difficult to track the social and environmental burden of an apparel item throughout its entire lifecycle; not to mention, apparel companies are not always forthright regarding corporate social responsibility (Fletcher, 2008). Designers have the opportunity to influence the direction of a garment, a collection, or even trends. By utilizing environmentally sustainable design strategies as well as material and apparel lifecycle predictions, a designer could inspire radical change in the apparel and fashion industry to improve management of natural resources (Black, 2008; Fletcher, 2008). Developing design strategies that reflect potential SAC's needs and desires allows the opportunity to incorporate environmentally sustainable and purposeful apparel design practices (Black, 2008; DeLong, 2009; Fletcher, 2008; Niinimäki, 2010).

Thus, the aim of this study was comprised of two areas of interest: sustainable apparel design and utilization of participatory design methods (see Chapter 3 Methods). The following literature review summarizes sustainable apparel design by addressing the environmental impact of the apparel and textile industry, sustainable apparel design strategies, and sustainable material usage.

Environmental Impact of the Apparel and Textile Industry

The apparel and textile industry is a vast and complex system that comprises multiple levels of involvement; and it employs more than one billion people around the world through corporate brand management, diverse manufacturers and material developers, retailers, and also

individuals in divisions of transportation and disposal (Black, 2008). The average consumer associates many of these stakeholders with segments of other industries such as agriculture, synthetics manufacturing, and waste management, and therefore they are ignored when weighing the accumulative impact of apparel and textile goods.

The development of textile fibers, whether natural or manufactured, utilizes a variety of enhancement processes to better realize the desired end use (Cao, Vogel Frey, Farr, & Gam, 2006; Kadolph, 2010). This enhancement of specific qualities and characteristics continues through each stage of production –yarn manufacturing, textile construction, dyeing and finishing, as well as final embellishment during the apparel construction stage. Many of these processes or treatments have been developed throughout centuries of textile and apparel production, resulting in a rich diversity of textile and apparel artifacts and history. However, some consider the aforementioned production processes currently used to exhibit a lack of corporate social responsibility and the environmental and social damage that has resulted from irresponsible business practices can no longer be ignored. Ranked only behind the automotive industry for environmental pollution levels, the apparel and textile industry must demonstrate the ability to anticipate environmental consequences and adapt in order to sustain itself as well as this planet for future generations (Black, 2008; Brown, 2010; McDonough & Braungart, 2002; Orzada & Moore, 2008).

The stakeholders are many, and the residual impacts of irresponsibility will linger for many years through environmental degradation and waste pollution. An extensive system, such as the apparel and textile industry, easily masks public knowledge regarding corporate social and environmental responsibility, including bad business behavior; likewise, consumers are unlikely to be familiar with the industrial impacts of such a widespread global industry. Still, even the

portion of the apparel life cycle for which the consumer is responsible, clothing consumption, is extremely detrimental to the environment through product care and disposal.

Winakor (1969) defines clothing consumption as encompassing the “whole process of acquiring, storing, using, maintaining, and discarding clothing” (p. 629). Winakor further illuminates each stage of the consumption process:

Acquisition occurs when the individual obtains possession of the garment, either for inventory or for temporary use. The garment may be new, or it may have been used previously. (p. 630)

Inventory is the stock of garments that an individual possesses at a given time. It represent those garments available for more or less regular use, including temporarily stored garments which will be worn again when weather or occasion permits as well as clothing in use and clothing being cared for. (p. 631)

Discard of clothing occurs when the garment leaves the possession of an individual; he anticipates no further wear from it for himself. Sometimes this garment will be worn again by another person... Physical condition is not the sole determinant of discard; a garment may be abandoned because it no longer fits or is out of fashion. (p. 631)

Included in Winakor’s (1969) definition of clothing consumption is the stage of a garment life cycle during which the consumer owns and cares for the garment and, due to high levels of water and energy consumption, this is a stage with serious environmental impacts. In fact, life cycle analysis studies report that the environmental impact of caring for a single garment is greater than the environmental impact caused at any other stage of the garment life cycle (Fletcher, 2008; Franklin Associates, 1993).

However, the need for environmentally sustainable design strategies within the apparel industry is not limited to any single segment of the life cycle. A keen designer should utilize a systems approach to anticipate potential use, care, and disposal when selecting materials and designing apparel items. Within the ever-quickenening fast fashion trend cycle, it is essential to

lessen the constant stream of incoming apparel goods and outgoing post-consumer waste (Black, 2008).

“Fast Fashion” Trend

“Fast fashion” is a term popularly used to describe current ready-to-wear production methods that are characterized by shortened trend cycles of mass-produced designs, which are often from low quality materials and construction, and seemingly disposable due to the inexpensive purchase prices (Black, 2008; Brown, 2010; Gwilt & Rissanen, 2011). Black (2008) asserts technological developments, international trade agreements and offshore manufacturing, combined with global movements in communication and marketing spurred the trend. As a result, there has been an upswing in cheaper goods, including inexpensive apparel products, from foreign nations such as China and India flooding the market at the cost of environmental and social damage (Black, 2008). Due to the increased speed of trend cycles, consumers shop more frequently and anticipate shorter apparel life cycles than those of past decades. This constant acquisition of new apparel, combined with “cheap” prices, reduces consumers’ attachment to garments and their perceptions of product value, thus creating a market for disposable apparel goods and ensuring that the cycle continues; pressuring the industry with demands for more “output [from manufacturers and suppliers] in less time” (Black, 2008, p. 14). Advances in society and technology have led modern cultures to devour fast fashion, yet they have also provided the resources and opportunities to source, produce, and sell fashion items that promote environmental sustainability and social responsibility. Therefore, to eliminate some of the environmental harm created by the apparel and textile industry, it is the responsibility of designers and apparel product developers to create innovative and sustainable solutions that are both evolutionary and revolutionary.

Strategizing Sustainable Apparel Design

Sustainable design strategies are methods for reducing the social and/or environmental impact of marketed and consumed goods. Sustainable design must be planned, organized, and critically evaluated prior to initialization of the design process; in effect, it cannot be successfully addressed as an afterthought (Black, 2008; Gwilt & Rissanen, 2011). For the purpose of this study, successful sustainable design strategies are those that combine “ecological...principles with concept innovation and a high level of design aesthetic” as well as positive consumer interaction feedback (Black, 2008, p. 17).

Known Strategies

Numerous authors have developed and categorically organized sustainable design strategies (Black, 2008; Gwilt & Rissanen, 2011; Lawson, 2006). Known strategies include: (a) design for disassembly, (b) design for waste minimization (no/low waste design), (c) design for social well-being, (d) design for longer lifecycles (slow fashion), (e) design for user participation, (f) design for product-service systems, and (g) design for end-of-life strategies (Gam et al., 2011; Gwilt, 2011; Lawson, 2006). Design for social well-being was not included within this review of literature due to it being a concept that more highly relates to social responsibility than environmental sustainability. Most of these strategies function best when planned prior to execution; however, successful application of these existing sustainable design strategies is still extremely under-developed. The difficulty of sustainable design is best addressed by Brown (2010):

In clothing it means sourcing and production that do not pollute through the process of manufacture and do not deplete non-renewable resources, whether

those are planetary or human. It refers to clothing that can be absorbed back into the environment when it has reached the end of its life. (p. 9)

Nevertheless, even this description of sustainable fashion does not address each of the issues that are being faced in the modern apparel industry. Black (2008) divides the multiplicity of issues into three areas, (a) product design and development, (b) production and manufacture, (c) profitability and investment in research. Due to the small scale and experimental nature, this particular study focused on the product design and development stage. The product design and development stage includes components of selection and usage across the product lifecycle, issues described as “fiber and materials selection and combination, reduction in waste including materials; environmental impact of dye pollution, water and energy usage; re-usability or recycle ability; design for entire life cycle; good design solutions and aesthetics; new technologies and processes” (Black, 2008, p. 45).

Certain sustainable apparel design strategies are more relevant to the product design and development stage addressed by this study. Therefore, this literature review explains these particular strategies more thoroughly because of their influence in the design process.

Design to disassemble. Two key principles combine when developing a “designed to disassemble” garment; a design must minimize material diversity and must be constructed for simple garment disassembly (Gam et al., 2011; McDonough & Braungart, 2002). As with other sustainable design strategies, design to disassemble must be an established design decision from the beginning of the design process as it influences material selection as well as garment design and construction. In order to maintain simple disassembly steps, the designer must work through a progressive system of evaluations beginning with material choice and the degree of material interaction and continuing through to the structural design of a garment. A key concept within

design to disassemble is keeping biological and technical nutrients separate within the product (Gam et al., 2011; McDonough & Braungart, 2002). Biological nutrients are materials that are biodegradable, thus they are able to be returned to the earth to nurture future growth. Materials classified as biological nutrients must be pesticide and residue free and use only non-toxic dyes and finishing chemicals (McDonough & Braungart, 2002). Technical nutrients are materials that will not biodegrade and are not safe for the natural environment. However, they can be continuously utilized within a closed-loop industrial system through recovery and remanufacture to create new products, such as high tech synthetics and minerals (McDonough & Braungart, 2002). One key factor of this “Cradle to Cradle” design approach is the elimination of waste; McDonough and Braungart (2002) explain this as the use of only technical or biological nutrients that are possible to separate. The nutrient cycles ensure that all components of a design are able to be returned to a form that does not harm the environment but rather imbues future design materials whether they are natural or manufactured (McDonough & Braungart, 2002). For example, while natural fibers can decompose and provide nourishment to future natural resources and many manufactured fibers can be recycled to produce new manufactured materials, textile blends pose a particular challenge, as they are unable to be separated. Additionally, notions such as closures and decorative elements must be easy to separate for recycle, re-use, or decomposition.

Design to disassemble has yet to be implemented as a successful industrial sustainable apparel design strategy due to the strategy’s reliance on either: (a) consumer disassembly prior to disposal or (b) ongoing retrieval of used garments for disposal processes by retailers (Gam et al., 2011). Furthermore, to be a viable sustainable apparel strategy, users of design to disassemble

garments must be educated regarding: (a) the types of materials within a garment, (b) the recognition of these materials, and (c) deconstruction techniques.

Within the design to disassemble strategy, materials cause significant design difficulties due to the need for separation prior to disposal. However, through the application of user-centered design, the designer could address these issues through consumer-targeted infographics designed during the product development stage. Another factor that may affect the success of this design strategy is the necessity for simplistic construction and low material interaction as consumer preferences for aesthetic qualities may prevent actual purchase behavior of environmental apparel products (Gam, 2011).

Design for waste minimization (no/low/zero waste). Like many strategies, material conservation is a historic tradition and is recently enjoying a revival; but this time its utilization is as an effort to conserve environmental resources as well as reduce waste. Prior to the Industrial Revolution, apparel was often home sewn or constructed by small ateliers, making garments both costly and time consuming. Thus, careful conservation of fabric occurred by strategically designing and arranging patterns to make use of as much fabric as possible (McQuillan, 2011). Unfortunately, as mass production drastically decreased the cost of textile and apparel manufacturing, manufacturers became less concerned with conserving fabric and within a modern apparel-manufacturing factory, as much as 20% of the total fabric source is swept away from the cutting room floor as textile waste (Rissannen, 2008).

Waste minimization entails a method of designing that creates little to no waste through the development of designs that utilize the full cut of cloth. Garment design carefully considers both to the three-dimensional form as well as to the two-dimensional layout of the pattern marker. This strategy utilizes unique arrangement of pattern pieces, jigsaw seam allowances, or

the combination of full cuts of fabric to reduce the amount of textile waste during the cutting process (McQuillan, 2011; Rissanen, 2008). This method effectively employs what would be garment-design waste as an addition to the overall aesthetic. However, the increased time spent designing garments with zero waste makes this an unlikely strategy for mass manufacturing, but a possible inspiration for design within this study.

Design for longer lifecycles (slow fashion). When apparel products are designed with the intention of being a closet staple for many seasons and even years, consideration must be given to various elements of design including style lines, degree of trendiness, resilient materials, color and print selection, and the actual purpose of the garment (Fletcher, 2008; Gwilt & Rissanen, 2011; Hawley, 2011). Emphasizing the design aesthetic and construction quality, slow fashion can be utilized in various markets ranging from high-end goods to art wear (Gwilt & Rissanen, 2011). Slow fashion often utilizes techniques revered as cultural traditions yet have fallen to the wayside during industrial production, such as techniques of hand construction or embellishment. A reflection of the slow fashion tenets of quality materials and meticulous construction is the manufacturer's suggested retail price, however, when considering the extended life cycle of these garments, price per wear is actually quite low (Brown, 2010).

Design for user participation. Incorporating user participation within apparel design allows the consumer to feel both an empathetic connection to the garment as well as fulfill the need for uniqueness with specialized designs, or transitional garments. INDiCustom, an online denim jean service, produces custom designed jeans specific to the user's measurements, fit desires, and style decisions; the company guarantees a perfect fit and boasts feedback from users describing the solution to all of their denim jean needs (INDi, 2012). However, the perfect fit for a pair of jeans made with premium materials does not come inexpensively, making this

experience above the economic means of what many consumers would be willing to spend on a single apparel item. Other designers have developed 'modular' apparel garments that can be adjusted by the wearer to model various styles, in theory eliminating the need for additional clothing items from the user's closet (Shine, 2012; Fletcher & Grose, 2012). Scottevest's "Transformer Jacket" allows the user to remove the sleeves of the garment in under five seconds, and provides a storage pocket within the garment for on-the-go transitions (Scottevest, 2012). Consumer willingness to "participate" in clothing design, whether it is for custom apparel items or the manipulation of a garment for multiple styles, is an area in need of further exploration.

Design for product-service systems. Product-service systems are programs in place to assist users in responsible product ownership, including maintaining the quality of the product through care, repair and alterations, or providing environmentally sustainable disposal methods (Marks & Spencer, 2008; Patagonia, 2013). Designers can align with product-service systems through careful planning and a considerable knowledge and understanding of materials and typical consumer usage. Sustainability leaders like Patagonia have introduced sustainability initiatives to enhance the lifecycle of apparel goods; consumers can now return goods to the manufacturer for repair, at a much lower cost than that of purchasing a new item, encouraging consumers to lengthen the apparel lifecycle rather than indulge in purchasing new. Moreover, other companies continue traditional product-services by offering in-house alterations to consumers of certain goods (Karimi, 2009). By creating better-fitted garments, the consumer is more likely to wear the item for a longer period.

Design for end-of-life strategies. Many larger brands leading the pack in corporate responsibility have developed end-of-life strategies specific to their apparel products. Through various recycling programs, discarded apparel is processed into items of everyday need such as

playground pellets or insulation (Gap Inc., 2012). Some companies have even developed websites to assist customers in passing on their used apparel goods. Recently Patagonia joined with eBay Inc. to assist customers in selling their gently used items (Patagonia, 2013). Many companies have begun designing apparel items that utilize recycled fibers in a closed loop system through the development of synthetic fleece textiles (Polartec, 2012). By designing end-of-life strategies, an apparel company is able to report that they are helping to manage post-consumer waste and are providing consumers with a disposal method that is conscience clean (University of Delaware Sustainable Apparel Initiative, 2009).

Materials

The most common approach to sustainable design is using “environmentally preferable materials” (Hiller Connell, 2011). Both large and small apparel design companies are able to produce collections that utilize this approach. However, life cycle analysis studies show that a fiber’s environmental sustainability value is not consistent from fiber production to final disposal—which makes determining a single most “environmentally preferable material” near impossible (Chen & Burns, 2006; Fletcher, 2008). Other designers and companies work hard to reclaim post-consumer waste apparel and textile materials, creating a closed loop process through re-design methods as well as industrial recycling methods (Polartec, 2012; Young et al., 2004). While numerous environmentally preferable materials are readily available on the textile market for apparel design businesses, the scale of this research study prevents acquisition and application of some such resources.

Fibers and Environmental Sustainability Value Variation

Natural fibers offer the benefit of being renewable as well as biodegradable. However, many of these fibers (e.g. cotton and wool), when produced in the traditional industrial manner carry the downside of environmentally impactful growth and production processes (e.g., pesticides, fiber preparation, synthetic dyeing, and finishes), as well as the unfortunate side effects of ground and water pollution through run-off and chemical seepage during disposal (Black, 2008; Chen & Burns, 2006; Fletcher, 2008; Rupp, 2008). Thermoplastic manufactured fibers, often produced from petroleum by-products through energy intensive processes, are commonly thought to be less environmentally preferable, when in reality the production process is often less resource depleting than that of natural fibers. While thermoplastic manufactured fibers will take considerably longer to biodegrade, they can be recycled into new fibers of equal or lesser quality (depending on the chemical structure) (Cao et al., 2006; McDonough & Braungart, 2002). Viscose fibers (fibers manufactured from natural materials), such as rayon, often are perceived to align with natural fibers but due to their manufactured structure these fibers combine the impact of both natural and thermoplastic manufactured fibers. Some less common textile fiber sources (corn based, milk/soy protein, lyocell and hemp) show possibilities of being less environmentally detrimental but are not yet widely available on the market. Organic cotton and wool, and vegan products such as wild tussah (peace) silk or vegan leathers offer other options for sustainable fibers (Fletcher, 2008). The downside of many of these raw fiber options is the reduced market size and the added difficulty of production, both of which cause a natural rise in market cost and eventually in consumer purchase price.

Reclaimed Materials

Another aspect of environmentally sustainable design focuses on reducing post-consumer waste; achievable through the creation of new textile materials from reclaimed soft goods or through upcycling and re-design. Recycling materials on an industrial scale often produces materials for use in alternate industries. When upcycling or re-designing previously disposed textile material, a designer is able to contribute to the effort to reduce waste materials, as well as lower the demand for newly manufactured materials (Chanin, 2010; Young et al., 2004).

Numerous industrial apparel corporations are involved in the effort to reduce post-consumer waste by developing product return services; e.g., Nike Inc. recycles shoe soles into pellets for children's playgrounds, Gap Inc. collaborates with Cotton Inc. in the "Recycle your Blues" initiative during which consumers return denim jeans to be recycled into housing insulation (DeLong, 2009; Gap Inc., 2012). Mass soft-good recycling programs conducted from consumer returns are becoming a more popular effort each year as large corporate apparel brands try to reduce negative environmental footprints. Beyond urging consumers to recycle numerous fibers for restructuring into new textiles, Patagonia also requests that, for a nominal fee, consumers return damaged apparel goods for repair (Patagonia, 2013a; Patagonia, 2013b).

The use of reclaimed materials for upcycling or re-design has both positive and negative design attributes. One positive attribute is that the designer often pays lower costs for the reclaimed materials. On the other hand, that designer must relinquish the ease of designing for mass-production due to the unpredictable nature of the material source; rarely will a designer receive multiples of the same material. In addition to the difficulties of mass-production, there is also a psychological resistance to previously owned apparel by many members of society (Young et al., 2004).

Environmentally Sustainable Apparel Consumers

Good design practice predicates an understanding of the target market. This study collected input from potential SACs, through participatory design methods, and then further developed and applied sustainable design strategies that reflected the results of the consumer research. The main impetus for the development of new environmentally sustainable design strategies or the use of existing strategies was from the participatory design research findings.

Numerous studies focused on understanding current and potential sustainability beliefs and behaviors among apparel consumer indicate that a gap remains between beliefs and actual behavior (Niinimäki, 2010). Research thus far has focused on consumer knowledge of sustainability and sustainable apparel consumption patterns (Niinimäki, 2010; Dickson, 2000; Hustvedt & Dickson, 2009; Kim & Damhorst, 1998). Many researchers suggest that while consumers share beliefs that value environmental and social sustainability, they are not necessarily purchasing sustainable apparel products to the degree that would be expected (Hiller Connell, 2010; Niinimäki, 2010). Using participatory design research methods, a designer or design team could attempt to bridge this gap by uncovering unsatisfied needs of the potential eco-consumer and creating designs that theoretically “speak” to those needs. The effort to reduce the environmental impact of apparel and fashion must be shared between the producer and consumer. “Consumers need to be viewed as responsible actors in fashion,” and it is the producers of apparel goods’ duty to provide items that fulfill the desires of the consumer yet are environmentally sustainable (Niinimäki, 2010, p. 152).

Conclusion

The apparel and textile industry comprises a vast collection of product development practices, many of which are not environmentally sustainable within the modern fast fashion cycle. Designers and researchers seeking to reduce the environmental impact are strategizing methods of environmentally sustainable fashion design. By advancing market research regarding potential SACs, further environmentally sustainable design strategies can be developed and implemented to inspire and influence environmental apparel designs. Referencing known sustainable design strategies, possibly in combination with new sustainable design strategies developed through participatory design, the designer should be able to create more market-successful sustainable apparel designs reflecting the attitudes, preferences, and behaviors of potential consumers within the target population.

Chapter 3 - Methodology and Design Research Process Model

This study aimed to engage potential apparel consumers in the design process through participatory design, in order to develop an environmentally sustainable apparel design that reflects consumers' psychological variables including attitudes and current apparel consumption behaviors. Additionally, the study aimed to evaluate the designer and participants' satisfaction with the participatory design methods and product prototype. Consequently, this study drew from previous design methodologies and process frameworks.

This chapter begins with an introduction to practice-based design research methodology, including its background in experiential learning and constructivism, application of tacit knowledge and reflection, and social context. The social design approach that includes participatory design methods is presented next, followed with a discussion of design process frameworks. The chapter concludes with the research design process model generated for this study.

Practice-based Design Research

The practice-based design research methodology aids in the development of original knowledge within art and design disciplines by allowing an individual to conduct research through experiential creative methods and active reflection in order to develop a designed artifact (Gray & Malins, 2004). Practice-based research methods make transparent, through rigorous record keeping, the exploration of original knowledge within fields that are commonly thought to lack research development, thus adding a component of reliability and validity (Gray & Malins, 2004). Such methods included in this research study were guided journals, photography, and moderated focus groups. The practice-based design research methodology accepts that learning

occurs through creative experiences, “it acknowledges complexity and real experience – it is ‘real world research’, and all ‘mistakes’ are revealed and acknowledged for the sake of methodological transparency” (Gray & Malins, 2004, p. 21). By reflecting on those methods and engaging in the design process, the researcher is able to gain the greatest insight into developing original knowledge. A dynamic relationship occurs, during which the researcher moves fluidly between moments in experiential design, reflection, and traditional research; allowing the experience to inspire research and the research to engage new design experiences.

Experiential Learning and Constructivism

Constructivism and early research in experiential learning from Kolb (1984) served as a foundation for modern practice-based research. After examining multiple constructivist learning models, Kolb (1984) introduced the concept of experiential learning by summarizing the constructivist viewpoint, “learning is described as a process whereby concepts are derived from and continuously modified by experience” (p. 26). From experiential learning, practice-based research developed, retaining the three key principles from Kolb’s concept as described here by Gray and Malins (2004):

- “learning is constructed as a response to each individual’s experiences and prior knowledge”
- “learning occurs through active exploration”
- “learning occurs within a social context – interaction between learners.” (p. 2)

These three principles of experiential learning combine tacit knowledge, reflective practice, and design in a social context, thus providing a snapshot into what is now modern practice-based design research.

Tacit knowledge. Practice-based research accepts that each individual possesses a type of unspoken knowledge influenced by prior life experience, a tacit knowledge. Polanyi (1966) describes tacit knowledge as a type of knowledge not easily phrased into words. He explains further with an example, describing how it is tacit knowledge that allows us to recognize a stranger's face even though we cannot phrase what characteristics combine to form recognition. For those acting within design research, tacit knowledge enables the recognition of positive combinations of design qualities, based on past design experience and psychological perspective; but tacit knowledge also goes beyond design recognition to engage the actor into fulfilling unspoken needs.

Reflective practice. Reflective practice, through an active engagement with the creative design process and artifact, encourages the researcher to consider thoughtfully the design development before, during, and after making. Reflection naturally occurs as part of the creative design process, but often it is without an intentional approach to reflection. Schön (1982) encourages that through careful record keeping the design process becomes transparent and can more directly be associated to the development of new designs. In essence, the researcher begins to understand his unconscious decision-making process and thus, can more ardently justify his decisions.

Throughout the duration of this study, the researcher employed reflective methods to develop a thick description of collected data and research procedures, utilizing photography, videography, and note taking. Concurrently, the study utilized traditional apparel design methods such as sketching, sampling, and prototyping. Evaluation occurred through personal reflection by

the researcher, interaction with mentors, and critique by the focus groups during product evaluation.

Design in a social context. Engaging with others during the design process allows the researcher to gain a greater understanding of the concept as it is viewed by an outside audience within a social and cultural context (Gray & Malins, 2004). Collaboration and critique are encouraged social methods of strengthening and developing the designed artifact. Another critical influence during design development should be the end-user; designs should be specific to a target market and developed with social and cultural climates in mind (Fuad-Luke, 2009). Through the inclusion of social contexts, be it direct or indirect, the researcher creates a more robust outcome.

The Social Design Approach

Social design is a design approach that involves a community of individuals for the purpose of developing a common perspective or designed outcome (Faud-Luke, 2009; Visocky O'Grady & Visocky O'Grady, 2006). Methods considered social design include: co-design, collaborative design (mass-collaboration), empathic design, experience design, participatory design, universal design, as well as user-centered design (human-centered design) (Fuad-Luke, 2009). Table 1 presents a brief description of each of the social design methods for comparison. Each method emphasizes cultural and social participation as key contemporary issues, also often highlighting the design economy and design democracy through the resulting systems and artifacts—that is, each of these approaches counter the concept of top-down decision making that is more commonly seen in design industries (Faud-Luke, 2009). As Fuad-Luke (2009) explains, by ensuring the participation of the users/actors that will eventually utilize the system or artifact

these approaches take a more democratic stance to new developments in design. A common belief among advocates of the social design approach is that each individual brings something different to the table that can benefit the resulting outcome (Faud-Luke, 2009; Grudin & Pruitt, 2002; Lahti & Seitamaa-Hakkarainen, 2005; Löwgren & Stolterman, 1999; Sanders, 2000). Thus, social design methods relish in tacit knowledge by collecting unique individuals, each with his/her own unique tacit knowledge-base, into a community for the purpose of concept development.

Table 1

Comparison of Various Social Design Methods (Fuad-Luke, 2009, pp 21-22)

Social design method	Description
Co-design	Design that brings users, actors and stakeholders into the design process on the basis that everyone likely to use a design has a voice in its conception.
Collaborative design (mass collaboration)	Participatory process and methodologies.
Empathic design	Combining qualitative methods of engaging with users with quantitative user data.
Experience design	Designing human experiences foremost and products, processes and services that deliver that experience.
Participatory design	A collaborative approach to the design of products, services, spaces or systems that involves actors/stakeholders in the design process.
Universal design	An approach that encourages designs that should be equally accessible and can be experienced by the largest possible number of people. Synonymous with design for accessibility, design for all, transgenerational design and inclusive design.
User-centered (human-centered) design	Design that focuses on the needs of the users and involves them in the design process.

Participatory Design

The various previously mentioned methods of social design have many similarities but differ by the stage and degree of user involvement (Fuad-Luke, 2009). It is common in the design discipline for the designer to work from the perspective of user-centered design. That is, the designer maintains a focus on the eventual owner/wearer of a produced artifact throughout the entire design process beginning with an investigation into that person's needs and concluding with the development of a thoughtful and purposeful design that reflects those needs. The practice of participatory design, increases the degree of user involvement, whereas, participatory design not only uncovers the user's needs, but also incorporates user participation during the design process. This research study utilized participatory design methods to involve the user into the design process.

Design Process Models

Several research studies in design have sought to develop a conceptual model to illustrate the design process, also known as the product development cycle (Lidwell, Holden, & Butler, 2003; Regan, Kincade, & Sheldon, 1998; Visocky O'Grady & Visocky O'Grady, 2006). Jenn and Ken Visocky O'Grady (2006) provide an iterative design (see Definitions of Terms) process for corporate design that alternates between analytical and creative stages. In academia, design process models have been suggested as educational tools for the instruction of emerging designers in order to train highly skilled and thoughtful product developers to produce artifacts through a transparent and systematic design process (LaBat & Sokolowski, 1999; Watkins, 1988). Several models have been adapted to particular products or industries, and reflect

attributes of iteration that are specific to routine stages of that product's development (Regan et al., 1998).

In apparel and textiles specific design process models have been developed by Watkins (1988), LaBat and Sokolowski (1999), Parsons and Campbell (2004), and by McCann, Hurford, and Martin (2005). Watkins (1988) discusses a design process that is an adaptation from the *Universal Traveler* by Koberg and Bagnall (1981). The process proceeds through seven stages of divergence and convergence: 1) accept, 2) analyze, 3) define, 4) ideate, 5) select, 6) implement, and finally 7) evaluate. LaBat and Sokolowski (1999) review multiple design processes, including Watkins', and eventually shorten the design process to three stages: 1) problem definition and research, 2) creative exploration, and 3) implementation. Parsons and Campbell (2004) discuss the implementation of new technology into the design process and chose the four following labels for design stages: 1) problem identification, 2) conceptualization, 3) prototype, and 4) solution. McCann et al. (2005) conducted a study that specifically sought to develop clothing that addresses end-user needs from technical, functional, aesthetic, and cultural viewpoints, thus the end-user heavily influenced the design process within their study. They chose to present their method as a “‘critical path’ to be considered throughout the design process” that is specific to apparel development (McCann et al., 2005, p. 2).

Consumer Needs Model

Similar to the research conducted by McCann et al. (2005) the current study considered consumer needs throughout the design process, as is inherent through the social design approach. The functional, aesthetic, and expressive (FAE) consumer needs model by Lamb and Kallal (1992) has long been a prevalent tool to guide apparel design. The model frames a ‘target consumer’ within his/her culture with individual FAE considerations (Lamb & Kallal, 1992).

Lamb and Kallal (1992), further relate the use of the model to a six-stage design process that was adapted from numerous other design processes, and specify the role a consumer needs model can serve within the design process. One striking example occurs within the evaluation stage:

Specific concerns within the broad areas of functional, expressive and aesthetic needs vary with the target market. Once these are identified, product assessment determines which concerns have been addressed or neglected. The results of this analysis could form the basis for new problem solving projects. (Lamb & Kallal, 1992, p. 46)

Earlier scholars have combined a consumer needs model with the design process to better achieve robust design development for a specific target market, function, or approach (Gam et al., 2009; Leerberg, Riisberg, & Boutrup, 2010; McCann et al., 2005). Within this research study, the consumer needs model was influential in the development of the researcher's design research process; elements of the consumer needs model are inherent in the User Research stage, and the latter stages of the design process when refinement and review occur. The influence of the consumer needs model within the design process, served as a conceptual guide to research development, and predicted to influence the decision making process through each stage of the design process and further the development of problem solving activity.

Design Research Process Model

During the formative research stages (see Definitions of Terms), the researcher developed an initial design process model specific to the proposed project, with influence from prior design process models and the researcher's tacit knowledge of the design process (see Figure 1). This model was developed in anticipation of the research study, revisions and reflections on this model are included in Chapter 8 of this thesis.

The anticipated research stages included in the initial model were Background and User Research, Identify, Ideate, Refine, and Execute, while Reflection and Parameters were to be ongoing throughout all stages. Each stage included anticipated activities, for example during the Ideate stage the researcher anticipated activities such as the generation of ideas, sketching and sampling, brainstorming, referencing inspiration, and sourcing materials. Meanwhile, methods of ongoing reflection throughout the design research process included internal and external forms of: documentation, review, and critiques. Additionally, ongoing parameters included the timeline, budget, available resources, problem context, and required skills. A final aspect of the initial design research process model was the cyclical arrows surrounding the stages of the design process; the researcher anticipated that the research would be conducted in an iterative manner. While some research activities would lead forward to the next anticipated activity, there was also the possibility that new problems or questions would arise and the researcher would return to an earlier stage of the design process before progressing onward. Additionally, as noted previously, experiential learning often leads at the conclusion of one research study to the next area of research and a return to the onset of the research design process.

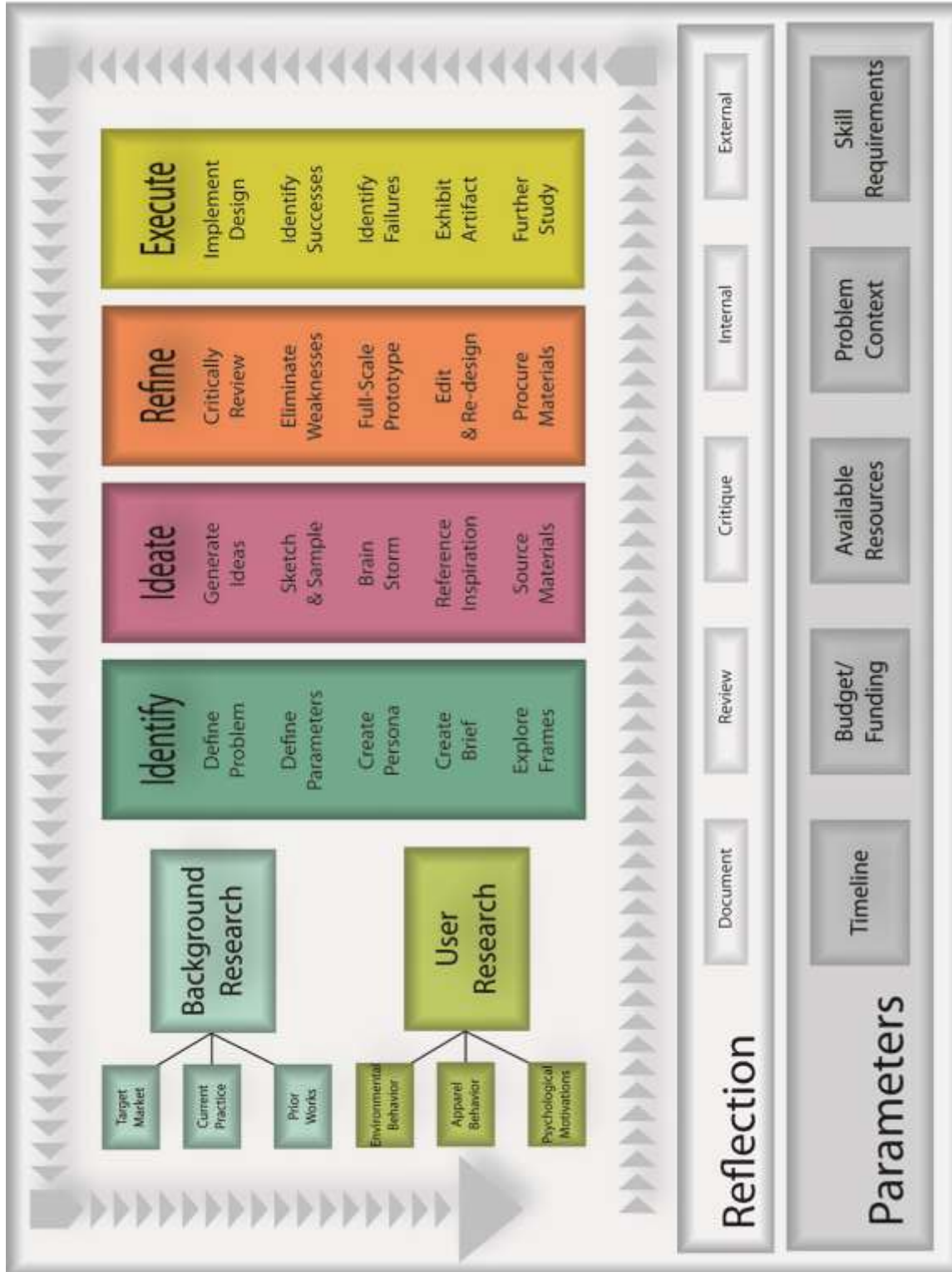


Figure 1. The initial design research process model prepared by the researcher during the formative stages of the research study.

Methodology Conclusion

In this study, the design process occurred within a practice-based design research methodology while participatory design methods from the social design approach influenced the use of established qualitative research methods. Practice-based apparel design methods were employed to both aid the development of the design concept as well as document the identification, ideation, refinement, and execution stages. Conducted from a social design approach, the designer and participants (users) engaged actively within the design process as the research concept developed from a communal discussion to an environmentally sustainable apparel design. The final product was based on user attitudes, consumption behaviors, and preferences towards environmental goods inputted during the early stages of design, as well as, decisions of aesthetic and functional desires implemented within the later stages of the design process.

Chapter 4 - Research Methods

This study sought to develop environmentally sustainable apparel that reflected young female apparel consumers' personal and psychological characteristics. In order to foster the design of environmentally sustainable apparel, the researcher engaged consumers actively in the design research process through the utilization of practice-based research methods. Combining traditional design with aspects of constructivism and experiential learning, practice-based research provided the necessary tools to cultivate the design of environmentally sustainable apparel. This study approached apparel design from a social design perspective using participatory design methods.

This chapter outlines the research methods employed in this research study. The first section describes the study's population of interest, sample recruitment and selection process, incentive, and participation requirements. The chapter then covers data collection including participatory design research methods. Following the section on data collection, is an explanation of data analysis and interpretation including design ideation and development.

Population of Interest

The research aim of developing environmentally sustainable apparel that reflects the personal and psychological characteristics of a large and influential target market influenced decisions about the study's population of interest. In order to gain insight into current fashion habits of a large market, as well as insight into the developing adult consumers in today's ecological and cultural setting, it was important to target a female, sample within the Millennials (Brock, Ulrich, & Connell, 2010; Kozar & Hiller Connell, 2010). Therefore, the population of

interest for this research was young female college students between 18 and 25 years of age. A discussion of the justification for the study's population of interest follows.

The Millennials

Millennials are individuals who were born near or between the years 1979 and 1994 (Schiffman, Kanuk, & Wisenblit, 2010). The Millennial cohort is more than worthy of attention because it is the largest generation since the Baby Boomer generation and it is comprised of over 77 million individuals (Brand Amplitude, 2009; Petro, 2013). Presently, the individuals within the Millennial cohort are coming of age, entering the workforce, and starting families –soon to be the driving force behind the economy as the Baby Boomer generation moves into retirement.

Millennial values. According to Brand Amplitude (2009), Millennials typically hold ten core values: (a) timeliness, (b) making a difference, (c) tolerance, (d) environmental stewardship, (e) authenticity, (f) family, (g) global perspective, (h) technology, (i) personal freedom, and (j) team work. Many of these values influence the generation's attitude of working as a team to make a change for the better of the planet and its people. Millennials marvel at change as they were raised in a time of great technological advancements, they encourage tolerance on a global scale as their own population is so diverse, and they value truth and positive change looking to past generations for lessons on living (Brand Amplitude, 2009; Brand Channel, 2013). The combination of values and experience make Millennials an optimal population for the consumption of environmentally sustainable goods.

Although Millennials are not currently the largest market for “green” goods, they are believed to be highly interested in global, environmental, and social issues (Brand Amplitude, 2009). The Millennial cohort prioritizes food, hygiene, and household goods (items perceived to

affect both the environment and consumers' bodies) above technology and clothing (Brand Amplitude, 2009). Speculation is that both price sensitivity and the smaller selection of "green" products within technology and clothing luxury categories contribute to this disparity between attitude and purchase behavior (Brand Amplitude, 2009). Increased engagement in environmentally responsible activities, such as recycling and buying recycled products, positively correlates with age, income, and education (Brand Amplitude, 2009); therefore as the Millennial cohort ages we will see increased environmental attitudes and behaviors. "While they are not yet set in their ways, they are forming preferences, exhibiting tendencies, and influencing one another's opinions and behaviors" (Brand Channel, 2013). It is likely that engaging the Millennial consumer in sustainable behavior early will lead to even greater environmental responsibility as she ages and increases her income and education.

Millennial market. The scale of impact on the remainder of the global population influenced by the Millennial market should be noted as a robust reason for increased research focused on this generation. In an interview between the Global Business Network (GBN) and Barbara Bylenga, President of Outlaw Consulting a trend prediction company, Bylenga states that, "the bulk of your trendsetters are in their teens and 20's...", thus according to trend distribution theories, this would suggest that the Millennial market has the potential to influence many generations of apparel consumers (2009). Bylenga further explains how the key characteristics of Millennial consumers will affect global business markets, "Gen Y's see themselves as change-makers...They see corporations as having lots of power but little heart, and they try to create change by using their dollars" (Brand Amplitude, 2009). Due to their increased use of social networking, the Millennials have also been cause for new marketing strategies (Petro, 2013). Millennials are known for sharing their experiences via tweets, status

updates, and blogs—and these experiences often relate to their experience with a product, good or bad (Petro, 2013). Corporations can tap into this influential market power by “recognizing that values and authenticity are important to this generation” (Brand Amplitude, 2009); companies that not only address issues of social responsibility in theory, but also follow through in practice will be endeared among this generation. Finally, Bylenga concludes “if you want to be relevant to Gen Y’s, you need to understand their mindset. Understand what they’re doing – and why” (Brand Amplitude, 2009). According to Jeff Fromm, for Millennial Marketing, “aside from functional and emotional benefits, Millennials demand to be active participants in the consumer journey” (2013), suggesting that this generation is prime for social design approaches such as participatory design.

Millennial summary. Millennials are a large cohort that are currently coming to age and will be influential within the global market place by means of population mass, financial input and trendsetting for many years to come. The values that motivate Millennials towards cause purchases, environmental beliefs, and global communities will lead the market for sustainable goods. By tapping into the mindset of this cohort a designer of sustainable apparel is likely to achieve a product more widely appreciated by the target market. Therefore, a sample from the Millennial population will perhaps anticipate future purchase attitudes and behaviors of the greater target market.

Research Sample

In order to conduct social design research a sample was needed from the target population. In 2012, 50.8% of the total population was female, indicating a slightly larger population of females than males, thus a larger target market (U.S. Census Bureau, 2013).

Additionally, compared to single males, on average single females spent \$222 more on apparel goods than single men in 2011 (Bureau of Labor Statistics, 2013). Therefore, traditional college age women are more representative of the population of interest than males due to their higher interest in apparel purchasing. By selecting a voluntary sample, the participants' backgrounds exhibited a wide range of interests and knowledge areas. For this study, there was one primary sample of female university students 18 to 23 years of age, and initially the study had a total primary sample size of 10 participants. In addition to being in college and between the ages of 18 and 25, participants were required to use Facebook and be able to meet at least three times for focus group sessions over the course of the study.

Statement on the Use of Human Subjects

The Committee on Research Involving Human Subjects at Kansas State University approved the procedures for protecting research participants involved in this research study on October 16, 2012. Committee approval grants agreement that there is no more than minimal risk to the human subjects, that the design of the study protected the rights and welfare of the voluntary research participants, assured confidentiality of information received from the participants, avoided possible risks to the participants, and utilized acceptable procedures of informed consent.

Sample Recruitment

This research was carried out at a Midwest land-grant university with a student population of more than 24,300, with students representing all 50 states within the US and 100 international countries (Kansas State University, 2013.) Campus wide recruitment occurred through the use of the university's daily student listserv email. The announcement, "Participants needed for apparel design research" was posted on Tuesday, October 23, 2012 beneath the

“Volunteer Opportunities” category (see Appendix A). Ten individuals responded to the posting. The researcher replied to each volunteer with basic information regarding the type and duration of the study, as well as, a request to attend an informational meeting. Of the first 10 responses, four volunteers attended the meeting and participated in the study. To recruit additional participants, the researcher placed a second, identical request in the student listserv. Four volunteers responded and the researcher similarly replied via email to these individuals. Of those responses, all four volunteers continued on to participate in the study. Finally, the researcher sent an email to the volunteers, encouraging them to invite friends to join the study. This method of snowball sampling resulted in two additional participants.

Sample Requirements and Information

An informational meeting was held on Thursday, October 29, 2012. This meeting introduced the participants to the study; informed of the researcher’s background, the duration of the study, and the format of participation. Additionally, the researcher explained the incentive for participation and answered remaining questions. After participants agreed that they were indeed still interested in participating, consent forms and basic demographic surveys were distributed and completed and weekly schedules were reported to the researcher to ease scheduling. The final items distributed to participants were instructions for completing the online digital ethnographic data collection package (see Appendix A).

Incentive. To encourage participation throughout the duration of the study, the researcher used a financial incentive. Participants were guaranteed \$20 for completion of the online digital ethnographic data collection package combined with participation in the first focus group session (ideation stage), another \$10 was given for participation in the second focus group session (refinement stage), and another \$10 for the third focus group session (evaluation stage). To

ensure full participation, the researcher later increased the incentive for the third focus group session to \$20. Therefore, each participant who completed the journal and three focus group sessions received \$50, additionally each time a subject participated in a focus group she had her name entered into a drawing for a \$100 value grand-prize. The grand-prize was a collection of items chosen by the researcher to represent socially and environmentally preferable goods, and it included an organic cotton t-shirt, a gift card to a “cause” oriented apparel business, two books on do-it-yourself redesigned goods, fair-trade organic chocolate bars and a fair-trade messenger bag.

Methods of Data Collection and Analysis

To develop an apparel item reflective of sustainable design and the ideas of the participants, this study utilized multiple methods to collect data, including journals and three focus group sessions. The participants first participated in an online collection of digital ethnographic data in the form of a two-week guided journal, followed by three focus group sessions. The first focus group session served as an orientation to the topic, clarified the journal data, and influenced initial design ideation. The second focus group session further developed the apparel design through social design ideation and design refinement. Finally, during the third focus group, participants engaged in active critique of the garment prototype, as well as provided feedback on the social design experience. Due to the data collection procedures and participants’ perceived comfort with and understanding of the researcher’s questions, each participant did not answer every question.

The remainder of this chapter outlines the progression of methods and procedures beginning with online data collection and analysis. Following the online section, discussion turns to methods and procedures of data collection and analysis during the three focus group meetings.

Online Digital Data Collection

The online collection of digital ethnographic data served to prepare the participants for engaged focus group participation by developing individual observational skills on the subject of interest. Collection of the online digital ethnographic data occurred via Facebook as a two week guided journal. After “friending” a research profile on Facebook, the participants joined individualized “groups” in which conversations could be privately shared between the researcher and each individual participant—ten private groups were created in total. Through creation of private access online groups, both the participant and the researcher could access questions and answers throughout the duration of the two-week period, allowing data collection to occur simultaneously with data review.

Online digital ethnographic data collection journal. The researcher posted an identical series of questions to each of the participants within the private access “group” setting. The researcher issued 57 questions over a period of 15 days. The questions explored the participants’ apparel experience and psychological attitudes and knowledge. A second intention of the questions was to increase participant awareness of decisions and observations related to apparel. Questions drew from nine possible subject categories, with two to three days devoted to each subject category. The nine subject categories included: (a) personal psychology, (b) apparel psychology, (c) apparel acquisition, (d) apparel care and storage, (e) apparel repair, (f) apparel disposal, (g) eco-conscious psychology, (h) apparel sustainability, and (i) future plans. Additionally, within the individual “groups,” the researcher encouraged participants to record

daily observations related to clothing, as well as upload or share relevant photos. Appendix A outlines the data collection materials created for the user research stage of the design process, including the entire online ethnographic journal.

Online inactivity and dismissal. If a participant became inactive during the 15 days of online data collection, the researcher sent the participant a reminder message via Facebook. The message reminded the participant of the importance of constant participation within the study and provided notice that inactivity beyond a duration of three days would result in dismissal from the study.

Participant inactivity was determined following two days without response to any of the daily questions. Throughout the two weeks of online data collection, the researcher sent six reminder messages; two participants each received two reminders, and two other participants each received a single reminder. Of those four participants who received reminders, one participant failed to complete the final three days of online data collection and did not attend the first focus group meeting, resulting in dismissal from the study. The remaining nine participants completed the online stage of the study without dismissal.

Online data analysis procedures. Throughout online data collection, the researcher viewed and analyzed participant responses daily. Analysis of the online data occurred in multiple stages, reflecting Miles and Huberman's (1994) three components of qualitative data analysis: data reduction, data display, and conclusion drawing.

Initial data display and reduction occurred through a series of organizational procedures. First, the researcher copied daily responses from Facebook into a word processing document and divided the responses by the corresponding question. Next, each individual document, representing a single question and corresponding responses, was divided into a folder

designating one of the nine subject categories. Primary summarization of the data resulted in a two-page outline that informed researcher preparation for the first focus group session.

Further analysis of the data occurred later in the design process following the first focus group session, through a second round of reduction, display, and conclusion drawing (Miles and Huberman, 1994). During this round, the researcher reread the individual documents, each representing a single question and corresponding responses, paying careful attention to themes and developing a system of weighting. Further representation of themes occurred through the selection of illustrative quotations. Comparison of the two analysis records, the two-page summary and the weighted themes with illustrative quotations, allowed the researcher to further reduce, refine, and recognize the trends within the collected data.

Focus Group Sessions

To facilitate the focus groups, the researcher divided the nine remaining participants into two groups based on availability. Each group met three times throughout the research study. These meetings spanned the duration of five months, beginning in December 2012 and concluding in May 2013.

For each of the three meetings, both groups followed the same format and allowed three hours for completion of each of the sessions. The semi-structured format allowed participants ample time to explore ideas while retaining direction from the researcher. The provision of refreshments, whiteboards, paper, and pens, encouraged continued attentiveness and participation. The researcher obtained participant permission to record each session via audio and visual methods. Sessions one and two were video recorded and session three was audio recorded with still photographs of the activity. The researcher also recorded field notes during the sessions.

Focus group session one. The first focus group session concluded the second stage of the design process, user data gathering, by clarifying the collected information from the online digital ethnographic journals. However, the key purpose of the first focus group was defining the parameters of the design problem, as anticipated during the Identify stage of the design process, and initiating design ideation, the next anticipated stage of the design process.

At the start of the focus group, the researcher reminded the participants of the voluntary nature of the research study and the right to cease participation at any time. The first session's activities began with semi-structured discussion. This allowed participants the opportunity to recall topics from the online portion of the study, as well as gain familiarity with the other participants. Appendix B provides a complete list of prepared discussion questions. The researcher then led the group in a round table free-word association game intended to relax participants further and allow the researcher insight into the participants' opinions related to topics of fashion, popular brands, and environmentalism. Following, a short refreshment break, the researcher presented an informal presentation regarding the environmental impact of the apparel and textile market. The presentation led to open discussion and ideation of the study's apparel product.

The data collected during focus group session one, was analyzed to inform the design ideation. This data influenced the development of the design concept statement and digital garment sketch presented for review and refinement during focus group session two. Focus group analysis procedures follow the description of the three focus group sessions.

Focus group session two. The second session allowed participants to confirm or refute the researcher's interpretations; evaluate initial ideation; and suggest other areas of development,

as intended during the Refine stage of the design process. Before proceeding with the session, the researcher reminded the participants of the voluntary nature of the research and the right to cease participation at any time. Evaluation occurred through participants' critique of the designer's interpretation and ideation based on the previously collected data, as it served to address the ideas developed during the first focus group sessions. A digital garment sketch presented a potential application of the design concept. Participants viewed the sketch before responding to researcher questions relating to functional and aesthetic decisions. Following which, the participants instructed the researcher on changes that they would like to see or implementation of additional ideas. Then, during the focus group, the researcher edited the digital illustrations on a large screen viewed by the participants. In this way, participants were actively engaged in the design process and could immediately see their suggestions implemented.

Following the second focus group session, the researcher reviewed the transcriptions for additional ideas or suggestions not already represented in the digital illustration. Discussion of the design concept, which occurred during the second focus group, allowed further refinement through an iterative process by the researcher. Additionally, the researcher proceeded to refine the digital sketch through a series of iterations (presented in Chapter 6) in accordance with the functional and aesthetic needs and desires of the participants. Following the analysis of information collected during focus group two, prototype construction began. Through the development of two prototypes the researcher further implemented and engaged in the design problem through physical interaction with functional and aesthetics components. Mentor critique and status updates occurred as a method of external evaluation when focus groups were not active.

Focus group session three. The final focus group session evaluated the second prototype of the apparel product, as well as the participants' participatory design experience. Once again, the researcher reminded participants of the voluntary nature of the research and the right to cease participation at any time. The third focus group session's activities included participants interacting with the garment prototype (including trying the garment on, transforming the garment, and viewing the garment on other participants), and discussing the design, the design concept, and the social design experience through a semi-structured interview. Refer to Appendix C to read the complete list of prepared evaluative discussion questions.

Focus group session analysis procedures. The three focus groups resulted in 538 minutes of audio data, all of which was transcribed. Initially the researcher began transcription of the audio data. However, after transcription of 147 minutes of audio data, the researcher decided to proceed with an online transcription service for greater efficiency. The chosen transcription service, recommended by a colleague, had an advertised 98% accuracy and quality rating (Transcription Star, 2013). Upon receipt of the transcription, comparison by the researcher of the audio file and typed transcription insured accuracy.

Analysis techniques of the transcribed focus group sessions comprised a series of traditional qualitative data analysis methods and less traditional design research methods. Initial coding and weighting related back to Objectives One and Two, which were to identify the current apparel and environmental sustainability practices and preferences of young adults who are potential sustainable apparel consumers.

Responding to Objectives Three and Four, which were to generate sustainable apparel design strategies and to design and develop an environmentally sustainable apparel product,

employment of a second level of analysis occurred to review the first and second focus group sessions. The second level of analysis focused on design ideation and began as a method of categorizing ideas by a) the sustainability issue addressed, or b) the apparel garment designed. Eventually the categorized design ideation data expanded into idea maps, with the idea sources (researcher, participants, mentors, outside) illustrated by color. Additionally, intuitive analysis occurred as the researcher reviewed the transcriptions and collected data. The researcher maintained the practice of note taking to record additional ideas, areas of interest, and sustainable design roadblocks. Further, the researcher reflected on research objectives in order to maintain a balanced influence between the participants, researcher, and mentors.

The third focus group session provided evaluative data and reflection responding to Objectives Five and Six. The researcher coded transcriptions in relation to the pre-determined questions, and further analyzed the data through compilation and comparison of participant responses.

Conclusion

In order to gain insight into current fashion habits of a large market, as well as insight into the developing adult consumers in today's ecological and cultural setting, it was important to target a female, college-age sample within the Millennials. Therefore, the population of interest for this research was young female college students between 18 and 23 years of age.

For this study, there was one primary sample of ten female university students within the Millennial generation. In addition to being enrolled females, between the ages of 18 and 23, participants were required to use Facebook and be able to meet at least three times for focus group sessions over the course of five months. Initially, the study had a sample size of 10

participants. However, the researcher dismissed one participant from the study at the conclusion of the online ethnographic journal due to inactivity; thus, only nine participants remained active for the first focus group. Participant 5 could not attend the second focus group session due to illness, thus only eight participants were included in the second focus group session. However, Participant 5 indicated through correspondence with the researcher that she wished to be included in the remainder of the study and the researcher agreed to her continued participation in an effort to retain sample participants. Regardless of the researcher's attempts to retain participants, the third focus group session involved only six due to the timing of the meeting during final exam week.

The ten participants partook in an online collection of digital ethnographic data in the form of a two week guided journal. The researcher then invited remaining participants to the three focus group sessions. The first focus group clarified data collected online, orientated participants to the research topic and initiated design ideation. The second focus group further developed the apparel design through discussion and design refinement. The third focus group engaged participants in active critique of the design concept and second garment prototype, as well as allowed for feedback on the social design experience.

Analysis of the online data occurred in multiple stages, reflecting Miles and Huberman's (1994) three components of qualitative data analysis: data reduction, data display, and conclusion drawing. The three focus group sessions resulted in 538 minutes total of audio data between each of the two separate participant meetings. Analysis of the transcribed focus group sessions comprised a series of traditional qualitative data methods and less traditional design research methods: including coding, weighting, mapping, and intuitive analysis.

Chapter 5 - Analysis of Objectives One and Two

This chapter presents the findings and discussion of the first and second research objectives. The first research objective was to identify the current apparel attitudes and consumption behaviors of young adults who are potential SAC, and the second research objective was to identify the current environmental attitudes and preferences of young adults who are potential SAC.

Division of the chapter is into three parts: participant introductions, research objective one, and research objective two. First, an introduction to the research participants provides background information on each participant and basic demographics. Next, the chapter proceeds to findings and summarization of the results related to the first research objective. The chapter then redirects to provide the presentations of findings and summarization of the results for the second research objective. Finally, a chapter conclusion links the two research objectives as it relates to the holistic purpose of the research study. In order to substantiate the analysis and conclusions, the researcher employs illustrative quotations from the online ethnographic journals within the text.

Introduction to the Research Participants

All of the research participants were female. The participants in the study ranged in age from 18 to 23 years old. These participants represent the age range of traditional college students, as well as the tail end of what is known as the Millennial generation. All of the participants were full-time students at the mid-western university where the research was conducted. At the onset of the research study, five of the participants reported part-time employment status, while the other five reported unemployment status. The average monthly

income reported by the participants ranged from \$0 to \$1200, and they estimated to spend between \$0 and \$150 on apparel purchases each month. Of the 10 initial participants, eight responded that they consider themselves “eco-conscious”. Refer to Table 2 for a complete summary of the demographics of the study’s participants.

Table 2

Demographics of Research Participants

ID #	Focus Group	Age	Year	Employment	Average monthly income	Average monthly clothing expenditure	Eco-conscious
1	A	18	Freshman	Unemployed	\$0	\$75	No
2	A	18	Freshman	Unemployed	\$0	\$15	Yes
3	B	18	Freshman	Part-time	\$280	\$65	Yes
4	A	19	Freshman	Part-time	\$56	\$40	Yes
5	A	23	Freshman	Unemployed	\$0	\$70	Yes
6	B	23	Masters	Part-time	\$1,200	\$60	No
7	B	19	Sophomore	Part-time	\$800	\$0	Yes
8	A	18	Freshman	Unemployed	\$0	\$150	Yes
9	B	23	Masters	Part-time	\$150	\$30	Yes
10	-	19	Freshman	Unemployed	\$0	\$75	Yes

In order to provide some perspective and increased understanding of the participants prior to presenting the research results, a brief profile of each participant follows.

- Participant 1 was in her first year of university studies for her bachelor degree in interior design. She values her relationship with God and reports photography, sewing, and crafts as her favorite hobbies. Her future goals include having a husband and children and pursuing a career in interior design. She anticipates apparel will have a huge impact on how clients view her as a designer and, therefore, her career.
- Participant 2 was in her first year of university studies for her bachelor degree in horticulture. She values her relationship with God and reports biking, hiking, and reading as her favorite hobbies. Her future goals are to have a family, pursue a career involved with horticulture, natural resources and the environment, make a difference in the world, and share her faith. She anticipates that she will need to dress practically for her career and looks forward to purchasing a wedding dress and continuing her casual lifestyle.
- Participant 3 was in her first year of university studies for her bachelor degree in history. She values herself, her family, and her religion. She describes herself as laidback, outgoing, and unique and reports rowing and fashion as her favorite hobbies. Her future plans are to complete her degrees in history and secondary education and then begin a master's degree while continuing to be an athlete and unique individual. She anticipates that fashion will promote confidence and assist her as an individual as she pursues her goals.
- Participant 4 was in her first year of university studies in the United States for her bachelor degree in architecture. She is originally from China. She values her

friends and family and reports drawing, singing, and watching movies as her favorite hobbies. Her future plans are to graduate with her degree and begin her career. She believes that by earning more money she will be able to dress more appropriately to achieve her goals.

- Participant 5 was in her first year of university studies for her bachelor degree in animal science with a minor in pet-food science. She values her boyfriend and her pets, describes herself as laid back, and reports training dogs, baking, and reading historical novels as her favorite hobbies. Participant 5 also noted that her body has a high sensitivity to environmental temperatures. Her future goals are to finish her degree and enter veterinary school, with the long-term goal of owning her own clinic and shelter. She does not anticipate apparel having an impact on her future goals as a veterinarian, but she does intend to remain environmentally conscious and aware of the apparel she purchases.
- Participant 6 was in her third year of university studies for her master's degree. She values diversity, describes herself as indecisive and impatient, and reports horseback riding, lacrosse and "being active" as her favorite hobbies. Her future goals are to finish her thesis, get a job, and finally grow up. She anticipates her appearance will help her achieve the position she would like to have by making positive impressions.
- Participant 7 was in her second year of university studies for her bachelor degree. She values her family, describes herself as shy and laid back, and reports volunteer work with children as her favorite hobby. Her future goal is to be an ER

pediatrician. She anticipates that her appearance at her interviews will assist her in entering medical school and pursuing her career.

- Participant 8 was in her first year of university studies for dual bachelor degrees in business marketing and apparel marketing. She values her family, describes herself as laid back, and reports running, shopping, and reading as her favorite hobbies. Her future goals are to maintain her grades through college, graduate, and get a good job with which she has the option to travel frequently. She believes that apparel will help her succeed in life by promoting confidence and comfort while providing her with a motivated mindset.
- Participant 9 was in her third year of university studies for her master's degree in veterinary medicine. She values her family, describes herself as quiet, and reports crochet, reading, and browsing stores as her favorite hobbies. Her future goals are to finish vet school and work in a private, small animal practice. She anticipates that she will often wear scrubs but will also want to appear professional and practical for her future work with animals.
- Participant 10 was in her first year of university studies in the United States for her bachelor degree. She is originally from Sweden. She values commitment, describes herself as passionate, and enjoys pandas, glitter, and traveling.

Participant 10 was dismissed at the study prior to the first focus group session.

The study began with ten participants. However, dismissal of Participant 10 occurred at the conclusion of the online ethnographic journal. Participant 10 completed the first 12 days of

the 15 required to complete the online ethnographic journal. On the 14th day of the ethnographic journal, the researcher sent a participation reminder, yet the participant did not respond. Due to the lack of response, the researcher dismissed Participant 10 from the study prior to the first focus group session. However, data collected from this participant during the online ethnographic journal was included in the data analysis and findings for the study's first and second research objectives. The researcher reached this decision due to the participant's response rate during the first 12 days of the online ethnographic journal, as well as the validity of her responses, regardless of her incompleteness of the study. Participant 10 had the lowest recorded response rate, having only answered 35 of the 57 questions; but her response rate is only three responses less than a participant who completed all 15 days of the online portion of the study. For research transparency, it is important to note, that in comparison Participant 2 had the greatest response rate at 56 of the 57 questions. The mean response rate of all ten participants was 48.2. However, if the highest and lowest response rates are removed, Participant 2 (n=56) and Participant 10 (n=35) the mean response rate only increases to 48.875. This calculation results in a total mean response rate increase of only .675, thus the researcher did not consider her response rate to be irregular when combined with the remaining participants.

Additionally, the qualitative research methods employed during this research study, both online and during focus groups, did not garner recorded responses to every question from each participant. Of the 57 questions posted during the online ethnographic journal, only 18 questions received responses from all ten participants. In fact, the mean question response rate was 8.456 out of 10. It became obvious that Participant 10 was not the only participant who did not complete all questions of the online ethnographic journal. However, the data collected throughout the study combined in a manner to create a holistic understanding of the participants'

responses, rather than analysis of individual attitudes, behaviors and knowledge. Furthermore, the participant was reflective of the sample, in that she was a student within the desired age range and a Facebook user. Thus, the researcher determined that the data collected from Participant 10's online ethnographic journal responses is comparatively valid to all other data collected.

Additionally, due to the accessibility of the online data collection, analysis of the participants' responses began immediately and occurred concurrently throughout the two-week journal process. Participant 10's responses were included within the early data analysis and it would have been nearly impossible to remove any possible influence she had prior to her incompleteness during the final three days of the journal. Therefore, her responses were included during analysis and informed the researcher's understanding of the target market's ideal apparel characteristics, influencing the remainder of the design process.

Research Objective One: Identify Current Apparel Attitudes and Consumption Behaviors of Young Adults who are Potential Sustainable Apparel Consumers

In this thesis, the first research objective was to identify the current apparel attitudes and consumption behaviors of young adults who are potential SAC. This research objective was designed to inform the researcher of current attitudes, apparel consumption behaviors and apparel knowledge of potential SAC within the Millennial generation. Thus providing user data prior to design ideation, as indicated in the illustrated model of the design research process. The researcher developed possible associations and conclusions from the participants' responses to the online ethnographic journal questions to understand behavioral decision-making further. Presentation of the findings begins with participants' attitudes towards apparel including apparel's significance within their lives. Then discussion turns to participants' apparel

acquisition behavior and motivators, including hedonic and utilitarian shopping experiences, purchase frequency, preferred retail environments, influential purchase factors influencing purchases, and previously used apparel purchases. Following which is participants' apparel care behavior including apparel storage, repair or redesign, and disposal. The researcher then summarizes the results of research objective one, collecting the target market's ideal apparel characteristics into a bulleted list. The ideal apparel characteristics inform further understanding of the problem and influence concept development.

Participants' Attitudes towards Apparel

In order to establish baseline knowledge of the participants' attitudes toward apparel, via the online journal, the researcher asked a series of questions regarding the importance and influence of apparel in the participants' lives (see questions 7-10 in Appendix A). According to Schiffman et al. (2010), "attitude is a learned predisposition to behave in a consistently favorable or unfavorable way with respect to a given object...attitudes have a motivational quality; that is, they might propel a consumer toward a particular behavior or repel the consumer away from a particular behavior" (pp. 228-229). Therefore, by asking the participants to reflect on these questions, the researcher sought to gain an understanding of the participants' learned predispositions towards apparel, thus gauging the influence of apparel related behaviors within their lives. This discussion begins with a brief illustration of participants' initial description of apparel's purpose.

Significance of apparel. Nearly half of the participants who responded believed that clothing is both a form of self-expression (n=4), as well as a source of comfort (n=4). Each participant believed that clothing expressed her personality and lifestyle. Additionally, each participant believed that clothing influenced their sense of comfort during an average day or

reflected their increased effort during a special occasion. This comment made by Participant 5, illustrates the connection between the participant and her outlook on life,

Clothing is extremely important to me. It's a source of comfort and self-expression. What I wear has a huge impact on my mood and what I do. If I'm wearing something uncomfortable it affects my confidence, makes me uncomfortable or grumpy; and I probably won't be as active until I change my outfit.

Further participant responses repeatedly referenced a belief that dress may potentially affect personal and social life events. Responses further indicated that this conviction influenced their moods and perceptions of themselves, as well as imagined judgment from others in the form of social feedback. Illustrated in a response from Participant 3,

The article itself I don't feel is that important. It is more on how you present yourself and feel. I like to always look nice because studies have shown it increases productivity and it really just helps you have a better attitude. Also I think that it is important to be prepared because you never know who you are going to meet and you want to leave a meaningful and lasting impression.

While participants stated that very few individual clothing items are of great importance; they did identify types of garments/accessories that they often wore as an outlet of self-expression, regardless of occasion. For instance, Participant 1 noted, "Every day I do wear a variety of bracelets with a watch though, as well as earrings. I feel like accessories are a big part of my everyday look."

Participants agreed that initial impressions form based primarily on an individual's dress, but further indicated that the most important aspect influencing that initial impression is appropriate dress for the occasion, regardless of personal style. Participants also admitted that other's personal style influences the participant's interest in further interactions, as exemplified in statements by Participants 5, 4 and 6.

Participant 5: I associate people who are well dressed as being more professional and dependable. I wish I could wear sweats everyday but I don't want to be thought of as lazy or unorganized.

Participant 4: What people wear plays a significant role in my mind especially for the first time. Because they are totally strangers when we meet but their clothes give me a direction to know them. If a person wears an old or broken coat, I may think he or she is poor or managing. However, if someone wears fashionable clothes, I will think he or she is showing off, which I dislike a lot. So I think I really like people who know how to choose their clothes on right occasions.

Participant 6: People that are way too dressed up (make-up, perfect hair, and clothes) kind of worry me; I cherish sleep too much to wake up early to look THAT good every day. They seem like they have to control every aspect of their appearance and are maybe hiding something.

Further, participant responses indicated an equation of self-respect with more conservative dress. Participants 5, 3, and 6 indicated judgment occurring based on revealing clothing in these comments,

Participant 5: Today, I saw a girl who was wearing short shorts. I thought she was completely ridiculous considering the weather and the fact that it's November! I feel she obviously doesn't have a lot of confidence in her personality and makes up for it by showing off her body.

Participant 3: ...if a girl is wearing shorts where her behind is hanging out then I would question how much respect she has for herself and what message she is trying to portray...

Participant 6: The problem I find a lot or maybe I was feeling old, I feel like all the skirts and dresses I ever buy are always too short... two more inches of material, just a little tiny bit and it would be perfect... I work at a bar, and so it's always that fine line of like looking cute, but not trying to look slutty. And I feel like if I brainstorm throughout the day and I have it picked out, it's good to go. But the days I don't, it's like 20 outfits.

Participants agreed that on occasions when they exerted extra effort into preparing an outfit, they received more compliments. Yet, the majority of participants chose to dress

comfortably on the average day, selecting sweats, jeans, or t-shirts rather than applying extra effort to dress nicely.

Conclusions drawn from Participants' Attitudes towards Apparel

Drawing from these findings, the researcher concludes that the participants' believe that on an average day, apparel can provide a sense of comfort or a sense of security, within new situations and environments. Participants understand that dress can also influence emotions such as discomfort or insecurity when worn inappropriately for the occasion. This attitude relates to a second attitude expressed by the participants that whether consciously or unconsciously, humans form opinions of others based on appearance and self-presentation. They also understand that judgment based on appearance is at times directed towards themselves from others.

These findings were influential during the design process as the researcher considered the user's functional, aesthetic, and emotional needs. It is clear from the responses presented above that, apparel serves a purpose to the wearer both psychologically and physically. The researcher concluded that apparel should provide a sense of comfort within a social setting through material selection and aesthetic elements of conformity, while also allowing for individual expression through transitional or user-designed aesthetic elements. This conclusion considered elements of functional and aesthetic needs, while also providing for the wearer's emotional needs for psychological security and expression.

Participants' Apparel Acquisition Behaviors and Motivators

In order to establish baseline knowledge of the participants' apparel acquisition behaviors and motivators, the researcher, also via the online journal, asked a series of fourteen questions (see questions 11-25 in Appendix A). As the previous section primarily focused on participants attitudes', understanding the connection between attitudes and behavior is important as the study

progresses. Schiffman et al. (2010), state that attitudes are relatively consistent with the behavior they reflect, yet attitudes are not necessarily permanent; “When consumers are free to act as they wish, we anticipate that their actions will be consistent with their attitudes” (Schiffman et al., 2010, pp. 228-229). Through the addition of negative situational influences, however, behaviors retreat from the anticipated outcome. Examples of potential apparel related situational influences include discounts or item availability. Attitudes and behaviors together form an important area of consumer research within this study as they directly relate to how participants act on their perceptions. Since the Millennial generation has a high level of interest in the environment, the current behaviors described by the participants, prior to prompting specifically related to the environment, indicate the un-influenced eco-conscious attitude and behavior of this particular group of young women.

Apparel acquisition motivators and frequency. Participant responses regarding apparel-shopping motivations categorize as either fulfilling an emotional need or fulfilling a physical necessity. This corresponds with research that has found shopping motivations to be either utilitarian or hedonic experiences (Babin, Darden, & Griffin, 1994). As elucidated by Babin et al. (1994), utilitarian consumer behavior is both rational and task oriented therefore, the perceived value of utilitarian shopping “might depend on whether the particular consumption need stimulating the shopping trip was accomplished” (p. 646). Whereas, hedonic consumer behavior is a personal experience and therefore more subjective, resulting “more from fun and playfulness than from task completion” (Holbrook & Hirschman, 1982, p. 137). The value of hedonic shopping reflects “potential entertainment and emotional worth” and the act of purchasing is often incidental to the experience itself (Bellenger, Steinberg, and Stanton, 1976 cited in Babin et al., 1994, p. 646).

Participants' hedonic apparel shopping experiences. Within this study, four participants described hedonic shopping motivations. These participants regarded shopping as recreation, a guilty pleasure, or an emotional pick-me-up. For example, Participant 8 explained how, for her, shopping is a form of entertainment, regardless of whether she purchases,

I like to look around at different things a lot – usually without the intention of buying anything, but if I find something really catches my eye and it fits me well (and the price isn't bad) then I have those spontaneous purchases too.

These participants noted the positive emotional response that occurs while shopping, as well as purchasing; they also recognized feelings of sadness or disappointment as shopping motivators. For example, Participant 6 recalled shopping when she was “sad or hung over... If I do poorly on a test or assignment I use it as a pick me up.”

Participants' utilitarian shopping experiences. Meanwhile, three participants related their tendencies to shop for apparel at seasonal changes, or when they were in need of a specific item. These participants described utilitarian shopping experiences as their normal motivations for purchasing. Replacing a lost or damaged closet staple or preparing for a significant event might motivate these participants to purchase new apparel. Participant 2 explained, “I normally don't purchase clothing unless I find one specific item I really want and then only shop for it... Or I will shop for something once what I have doesn't fit or is worn out.”

Frequency of apparel purchases. When asked how often they purchase apparel items, responses unexpectedly fell into two distinct categories. Seven participants responded to the question as the researcher had anticipated, with a standard calendar interval, for example, “weekly” or “monthly.” However, three participants responded in an unanticipated manner, instead relating the frequency of their purchase behavior to a need for a specific item.

Interestingly, the responses regarding the frequency of shopping aligned with the responses regarding hedonic or utilitarian motivators. Those participants who shop for hedonic recreation report shopping at a standard calendar frequency, similar to how one would report the frequency of other recreational activities like dancing, reading, or hunting. Whereas those who shop for utilitarian needs, report their shopping frequency in relation to the item sought. Participant 10's responses below are an example of a hedonically motivated shopper and Participant 2's responses are an example of a utilitarian motivated shopper.

Participant 10: [What motivates you to purchase clothing?] It really makes me happy. I have a borderline problem. [How often do you purchase apparel items?] A couple of times a month...

Participant 2: [What motivates you to purchase clothing?] I have to have money available to purchase clothes... otherwise I just make-do with what I have until a birthday or Christmas. I look for inspiration though, and if I find something cute that I like, I will try to save up for it eventually. [How often do you purchase apparel items?] I normally don't purchase clothing unless I find one specific item I really want and then only shop for it. Otherwise, I shop seasonally, such as for back to school, Christmas presents, or a new swimming suit. Or I will shop for something once what I have doesn't fit or is worn out.

A final aspect of purchase frequency, recognized by all participants was the availability of money. More specifically, as a hedonic shopping motivator, some participants mentioned shopping more frequently around birthdays or holidays when spending money is more readily available.

Participants' preferred retail environments. Participants reported habitually returning to stores in which they were already familiar with the available fit and styles. Further, many participants noted seeking out specific items from specific brands, rather than procuring all items from a single source.

Participant 3: I buy pants at the Loft as they are the only ones that carry the size I need. I get all solid staples at the Gap such as tanks, t-shirts, cardigans. At J-Crew and Banana Republic, I get more unique shirts or dresses. I also get a lot of unique pieces from Marshalls.

Participant 9: Kohl's is probably my favorite place to shop, and it makes me really sad that we don't have one here. I occasionally go to other mall type places like JC Penny's or Dillards, but not as often as Kohl's. ...I don't buy things online because I HAVE to try something on first. There are way too many things that I like on the hanger that just don't fit my body type well.

Only Participant 9 mentioned the use of online retail options. The absence of additional responses discussing online retailers might indicate that shopping for apparel online is not as common among these participants as shopping at brick and mortar stores.

Influential apparel purchase factors. When asked in the online journal (see question 15 in Appendix A) what factors they consider when purchasing clothes, the most commonly mentioned factor was "price" (n=10). The second most commonly mentioned factor was "fit" (n=9). Further, four of those nine responses mentioning "fit" specifically cite it as the most important factor. Additionally related to discussion of apparel purchase factors, participants noted a psychological decision-making process that weighed "price" against the other factors as the final determinant prior to purchasing. For example, Participant 8 describes her decision-making process while shopping,

When I'm looking for clothes, the first thing I look at is the style/ uniqueness of the garment. I don't want something that everyone has. Once a piece of clothing has caught my eye, I look at the price and see whether the price is a justification for the quality.

Participant 2 describes a similar process of decision-making, "First I need to think the item is cute or else I won't even try it on. Then the fit matters a lot, and after comes the price."

Also via the online ethnographic journal, the researcher asked participants whether they would prefer a higher quantity of low-priced items or a lower quantity of high-priced items (see

question 16 in Appendix A). In a few instances, the participant mentioned a preference for owning a lesser quantity of more expensive items, but the majority (n=8) noted a preference for a greater quantity of less expensive items to increase the variety and versatility of their overall wardrobe.

Participant 6: Two-three expensive t-shirts, this is a method I am learning to adopt. I'm trying to re-vamp my closet into "adult" clothes! With a professional closet you only need a few "key items" in my mind (black pants, grey pants, two skirts, and a couple blouses) then rotate through these items to generate new outfits.

Participant 8: I would rather have several inexpensive t-shirts because I like variety in my wardrobe. I also like to dress fairly trendy, so I do not want to waste money on something that may go out of style shortly.

Participant 9: If we're specifically talking T-shirts –several inexpensive ones. Mostly because most t-shirts are the same and I wear them a lot so it's nice to have a lot of them around. Even if it was dress shirts or something, if I can find things on sale that are therefore cheaper but still nice I would rather get more [quantity] for my money.

Further supporting this behavior of seeking out inexpensive items in order to increase the quantity and therefore the variety of their wardrobes are the responses related to the frequency at which the participants shop sales. Only two participants stated that they do not intentionally seek out sale items when shopping, whereas the majority of responses indicated habitual sale shopping. Participant 3 explained, "I honestly rarely ever buy anything at full price; I just think it is unnecessary when you can get it at a better price." Similarly, Participant 7 stated, "Every time I go shopping I look for sales and have a hard time buying clothes that aren't on sale, even if someone else is buying them for me."

Previous responses collected within the apparel attitudes category indicated that participants believe clothing is very important in successfully navigating personal and social environments. In combination with the responses collected within the apparel acquisition

category, this indicates that participants may regard wardrobe variety as a very important social cue even more so than wardrobe quality.

Previously used apparel purchases. The researcher also asked participants questions regarding their acceptance of vintage, retro, and second-hand clothing. Recognizing the importance of self-expression and wardrobe variety among the participants, it was not surprising that the participants expressed openness to vintage, retro, and second-hand clothing.

Participant 3: Yes! I pull a lot of inspiration from the 50's and 60's, I love finding vintages pieces and mixing them with modern ones. I am huge into someone else not having the same pieces as me, so it really gives me a chance to find unique items and really make them my own.

Regardless of responses professing a predilection for vintage/retro styles, most participants indicated that they rarely shop specifically for vintage/retro clothing.

Participant 3: It just depends on when I come across something, there are some cute items at the antique store in Olathe I go to and also Westport is a big hub for vintage items which I love, I just don't make it down there as often as I would like.

Participant 5: I don't set out for vintage clothing. I don't have much luck at thrift store for vintage clothing so I go for vintage styles at department stores. I like some of the styles at American Eagle, Aerie and Delia's. Also, one of my favorite sites is modcloth.com. They have TONS of retro style dresses that are so adorable! I wish more people dressed like that.

A similarly strong response indicated participants' willingness to wear second-hand clothing (9 out of 9 responses), and when asked where and how often they shop for second-hand clothes a short list of potential shopping venues were described (see questions 21 and 23 in Appendix A) . Yet, when the researcher asked the participants where they shop for apparel, few participants actually listed second-hand clothing stores as a location they regularly frequented (see questions 13-14 in Appendix A).

Participant 1: [Why or why don't you wear previously owned/used clothing?] I wear previously owned/used clothing because I see nothing wrong with it as long as it's

in good condition! Most of the clothing that was made back then was made with better quality than clothing is made now-a-days. Plus I like the uniqueness you can find from older clothes. [Where and how often do you shop for second-hand clothing?] I go to Goodwill sometimes, but I find some of the smaller local thrift stores have the best finds! I don't go that often, only every now and then when I'm 'in the mood' to thrift, since most of the time it can be hit and miss.

Participant 9: [Why or why don't you wear previously owned/used clothing?] I do wear previously owned clothing and I guess it's because I grew up with hand-me-downs, both giving and receiving them. So as long as they look taken care of and are clean, I don't have a problem with it. [Where and how often do you shop for second-hand clothing?] Rockstar & Rogers again, and about once every few months. Though I don't always find something.

One area of second-hand clothing the participants were not enthusiastic about was swapping clothing items with friends. Participant 1 further explained, "I find it hard to swap clothing with friends most of the time either because of size difference or style difference." This response, as well as others, indicates the possibility that participants' desire for uniqueness in their wardrobe outweighs the willingness to share or swap clothing with close friends.

Conclusions drawn from Participants' Apparel Acquisition Behaviors and Motivators

From these findings, the researcher was able to draw conclusions informing the latter stages of the design research process. For example, participants' tended to be motivated to shop for a variety of both hedonic and utilitarian shopping experiences; additionally some of their personalities lent themselves more towards one shopping behavior than the other. This finding was influential for the researcher when considering the appeal of the garment to both consumers shopping for hedonic and utilitarian purposes and suggested that the combination of functional and aesthetic variety could increase the garment's market potential.

Participants indicated preference towards brands and styles with which they were already familiar. However, the lack of small apparel companies or individual designers specified within

the participants' responses could be indicative to the slow growth of environmentally sustainable apparel design strategies promoted most often by burgeoning young designers. Successful environmentally sustainable design strategies must come from larger, more notable brands to gain greater popularity and adoption within the market.

Participants addressed the factors that most highly influence their purchase decisions, as first impression (style, color, and wardrobe versatility), fit, and finally price. These results are similar to those reported by Eckman, Damhorst, and Kadolph (1990) regarding women's in-store apparel purchase decision process. Thus from the apparel designer's perspective, these factors should be considered as highly important to the development of the final apparel product. These findings suggest that designers should consider creating garments with an aesthetically pleasing first impression, good fit through appropriate design elements and construction techniques, and finally garments should remain within the target market's price category. Additionally, participants indicated that variety and versatility were highly important to their purchase decisions, opting for many items at low prices rather than a few higher priced garments. This finding further supports the concept of transitional items that can provide greater variety and versatility within a user's wardrobe.

Participants indicated an appreciation of vintage, retro, and second-hand apparel yet admitted that shopping for such clothing is not as frequent as shopping for new apparel, due to the difficulty of finding appropriate sizes or appealing styles. This could inform the design of vintage styled garments or present a source for locating unique or individual materials and notions to be implemented as a transitional element for new apparel.

Participants' Apparel Care, Repair, and Storage

Understanding apparel care, repair, and storage behaviors among the sample was important to gaining insight into an area with which participants are familiar and environmental improvements could be ideated and initiated. Assuming the majority of consumers among the Millennial generation do not have extensive backgrounds in textile science and construction it is necessary to understand what knowledge they do possess and how they are implementing that knowledge to care for their apparel in efforts to extend its lifespan. This section presents the first commonality among participants current behavior, a desire for increased storage space. Then the section discusses laundering behaviors. Finally, the section concludes with a presentation of participants' reflections on apparel repair, alteration, and redesign.

Apparel care and storage. The online journal asked participants questions regarding their habits and behaviors of apparel care and storage (see questions 27-32 in Appendix A). One commonality was the desire for more space to store clothing, preferably a hanging solution rather than a folding solution, as indicated by Participants 6, 8 and 9.

Participant 6: Ideal storage would be a bigger closet with more areas to hang stuff up. Maybe built-in shelves for purses and hooks for scarves. A wall with racks for shoes and ample space to move around in. (Like the Sex and the City one!)

Participant 8: My ideal storage would be a large walk-in closet. I would have lots of hanging space so that I could hang up all of my shirts, pants, jackets, sweaters, etc. Ideally, I would LOVE everything to be hanging up, even t-shirts. I hate folding clothes and my drawers are what get disorganized the fastest. I would have shelves built in to line my shoes up on. I would have an island in the middle of my closet that I could store my undergarments in the drawers, as well as have drawers for my jewelry.

Participant 9: A large closet that can hold hanging clothes on all sides and the hanging racks are high enough that drawer containers can sit underneath and there's room on the walls next to the door that has hook and things to hang bags, scarfs and other accessories. Also hanging racks and slots for shoes. And there must be

lights in the closet too, the one I have now doesn't have any and it drives me crazy!

Apparel laundering. Regardless of all other factors or commonalities discovered through this research study, apparel care behaviors seemed to vary among participants. The researcher sought a connection between “care instructions” during purchase decision and actual care behavior, yet one could not be identified. For example, a participant who mentioned “care instructions” as a factor while making purchase decisions later admitted that she leaves her clothing on the floor and only launders it every few weeks when she has run out of clean garments. Another participant who did not mention care instructions as a factor during purchase decisions later explained a detailed laundry routine of separating, air drying, and ironing. The researcher sought a relationship between apparel quantity and care behavior, yet again one could not be identified. For example, Participant 10 explains, “Quality over quantity. I would rather have one Chanel Tweed jacket than every coat Target ever created” yet later she admits that her clothes spend a majority of the time on the floor. Participant 8 would prefer to have a number of inexpensive items to maintain wardrobe variety, yet she pays great attention to care labels even explaining situations that require professional care. Additionally, it seems that regardless of other factors related to apparel, care is one behavior that is a learned trait from family and friends.

Participant 2: Because I live in the dorms I have had to switch my clothes washing habits. I wash my clothes in the machines in the dorms, which are a lot different than the machines we have at home.

Participant 8: I try and save all my laundry for when I go home on the weekends. I do not like doing my laundry in the dorms because the machines are always busy, it can be awkward, and the laundry area kind of grosses me out... My washer/dryer at home. They are kind of older machines in the unfinished portion of my basement. We have a large table that I can separate my clothes on and then put them into the wash. I fold my clothes right after they come out of the dryer and then put them in my laundry basket. I take the laundry basket back to the dorms and try to put my clothes away as soon as possible!

Repairs and alterations. Via the online ethnographic journal participants were asked questions regarding apparel repair (see questions 37-38 in Appendix A). Questions related to participants' ability and willingness to perform repairs, as well as their willingness to have items professionally repaired or altered. Three participants indicated that they do not take clothing to a professional for repairs or alterations. They also indicated that they had some sewing skills and could seek assistance from their mothers should they need to repair or alter an apparel item. Participant 9 explains, "I've never had this [professional repair or alteration] done, largely because many things I can fix on my own and those that I can't my mom generally can."

Four participants indicated an unwillingness to pay for professional repairs or alterations. Participant 3 and 6 explained that financially they could not afford professional assistance, Participant 3 explained, "I haven't before only because of the cost, but when I have a career I will probably do that for pants or blazers." Participant 6 would like to complete her own alterations and repairs to save money, "No I do not... because that would cost money and I'm a poor grad student. I wish I had a sewing machine here to alter my own clothes."

Two participants indicated a willingness to pay for professional repairs or alterations only on special occasion garments. They also indicated that they may extend an effort to repair unique or expensive garments themselves but would be more likely to discard a damaged everyday item immediately.

Participant 1: Hardly ever because if it's simple enough I can do it myself. The only clothing items I've ever gotten professionally altered were my prom and homecoming dresses. [What do you do with clothing when it becomes damaged?] I either throw it out or repair it myself, or have my mom repair it.

Participant 2: I have had both of my prom dresses professionally altered because I do not own the proper machines to do so myself and wanted the items to fit well since they were expensive. My mom is a very skilled seamstress, but we still take the

dresses to be worked on by someone else because of the types of fabrics the dresses are made of and the expense of the items. [What do you do with clothing when it becomes damaged?] Sometimes I try to mend it or make it into something else, but the majority of the time I'll throw it out, put it in the scrap fabric box, or donate it.

A single participant indicated a willingness to have professional repairs or alterations on all items that require such things. She also indicated that rather than attempt to fix an item herself, she would either have it repaired professionally or throw it out and shop for a replacement, if it is an inexpensive item.

Participant 8: I do not usually know how to repair damaged clothing so I take them to a seamstress. Usually she just does little things like sew on a loose button, fix a hole, etc. I have also had her alter some of my clothes. I almost always have to have pants and jeans hemmed. I also had the seamstress alter my two prom dresses. She had to take them in as well as cut a considerable amount off the bottom... It's actually my neighbor so it's super convenient and cheap. [What do you do with clothing when it becomes damaged?] It depends on what kind of damage. If something has a hole and I really like it, I will take it to the seamstress (my neighbor) for her to fix. If it's stained, I will take it to get dry cleaned. I try and fix the small damages, but if something is majorly damaged then I will just get rid of it. For example, the other day I knocked over a candle and it landed on my laundry basket, getting wax all over my clothes. I had a few clothing items that I took to the dry cleaners to get the wax out (jeans, a nice jacket, and a few tops) but I threw away the other stuff that I didn't want to spend money fixing, when I could just go buy a new one (leggings, t-shirts).

Redesign. Also within the apparel repair category, the researcher asked participants questions regarding their willingness to re-design or re-purpose a garment. When asked when they might attempt to re-design a garment, four out of seven responded that they had never done this and did not anticipate ever doing this. Participants who responded as such, simply stated that they had never re-designed a garment, or that they would never re-design a garment. No follow up questions were asked on the subject to further understand why they would not re-design garments. Other participants recounted utilizing inspiration or instructions found online to deconstruct or re-size t-shirts or transform jeans into jean shorts. Those who had attempted a re-

design mentioned utilizing items that were either no longer functioning as the original garment, was an inexpensive thrift store find, or did not fit well. These responses might indicate that the participants believe the garments have little value before attempting to re-design it, and possibly they lack confidence in their abilities to re-design a garment successfully. Participant 5 gave an example of a re-design she had attempted the previous summer,

The only example I can think of is transforming jeans that don't fit anymore into shorts. I did that this summer with several pairs of jeans that fit fine in the waist but were either too tight or too loose in the legs and I just never wore them. Instead of spending tons of money buying new shorts, I found a link of Pinterest showing you how to correctly turn jeans into shorts (who knew you shouldn't just cut straight across?) and different ways to accent them, like adding lace or distressing them.

Participants' Apparel Disposal

Through the online journal the participants answered questions regarding numerous possible apparel disposal situations in order to deduce when they believe an item was no longer of value and their motivations for disposing of apparel (see questions 39-47 in Appendix A). Questions related to disposal motivations including sizing, trendiness, and damage provided opportunities for participants to explain various possible methods of disposal.

Disposal motivated by garment size. When asked what they do with apparel that is no longer their size, eight responses to the question indicated that they at least attempt to pass the clothing on to family or friends. Further, six responses indicated that an attempt would be made to donate the item to a charitable organization, two responses indicated that an attempt would be made to sell the item either at a garage sale or second-hand store, one response mentioned repurposing the item, and one response mentioned throwing the item into the trash. Participants were able to list multiple disposal methods within a response. For example, Participant 5

explains, “If it is still in good condition, I donate it to Goodwill or sell it at garage sales. If not, then I just throw it away.”

Disposal motivated by garment style. When asked what they do with apparel that is no longer in style, six responses to the question suggested that they would continue to wear the item as part of their average wardrobe, four responses included donation as an option, three responses suggested that this is a non-issue due to the careful acquisition of classic styles, and one response indicated passing the item on to family or friends. Participants could list multiple disposal methods within a single response. For instance, Participant 9 states, “I don’t really focus on this unless I don’t like it anymore. Then I either keep it in the back of my closet for a while, or I donate it.”

Disposal motivated by garment damage. When participants were asked what they do with apparel that is damaged, eight participants responded that the item would possibly be thrown in the trash, seven responses included the option of either repairing the item herself or having it repaired, five responses included options for repurposing the fabric, and two responses included the option of donation to a charitable organization. Participants were allowed to list multiple disposal methods within a single response. Illustrated by this response from Participant 2, “Sometimes I try to mend it or make it into something else, but the majority of the time I’ll throw it out, put it in the scrap fabric box or donate it.”

Comparison of apparel disposal motivations. Comparison across multiple responses within the apparel disposal category revealed that participants seem to have an understanding of a garment’s value. When participants were asked what they do with apparel that is no longer their size, only one response included the option of trashing the garment, all other responses were predominately related to giving the garment away either to family, friends, or a charitable

organization. Figure 2 provides a summary of the participants' disposal strategies and these results perhaps indicate that participants realize the garment may still have value to others within its lifespan, though it no longer serves a purpose within their wardrobe. When asked what they do with apparel that is no longer in style, the majority of responses again centered around continuing the lifespan of the garment either within their own closet or by giving the garment away to family, friends, or a charitable organization. These results indicate that perhaps participants do not believe that a garment has lost value when it is no longer on trend. Finally, when asked what they do with apparel that is damaged, responses were generally split between repurposing the item (either as work clothes or usable textile), repairing the item or ending the lifespan of the garment by trashing it. This response in combination with previous responses would suggest that participants are unlikely to trash garments before they are damaged beyond reasonable use to themselves or others.

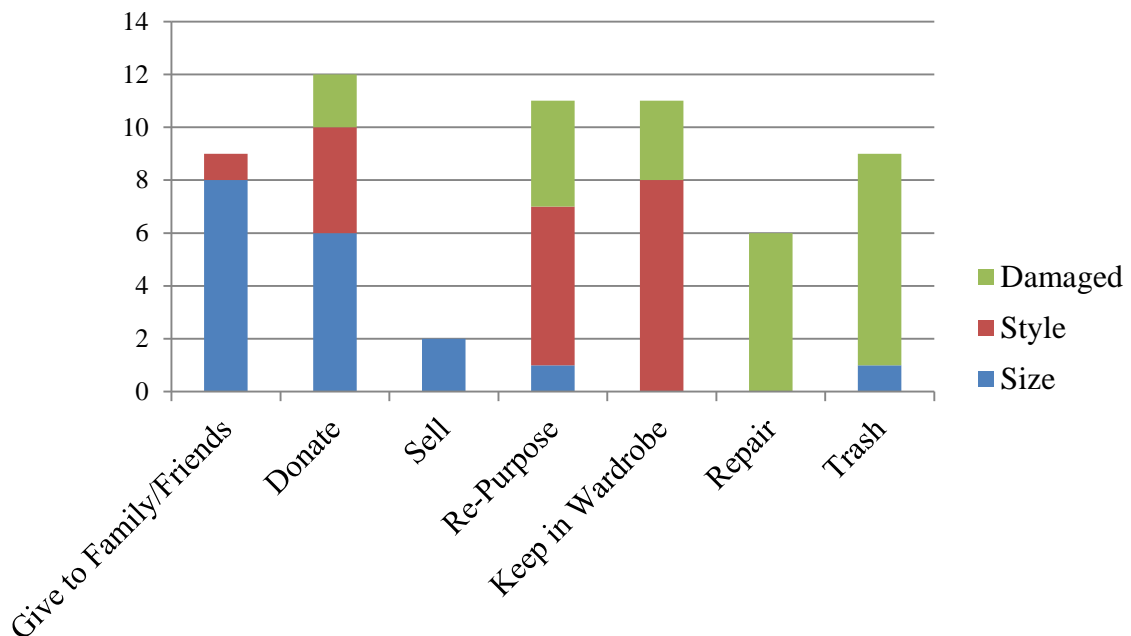


Figure 2. Comparison of apparel disposal methods depending on disposal motivators.

Frequency of apparel disposal. When asked how often they dispose of apparel items a common response was “seasonally,” and often induced by the need to rotate the wardrobe for the weather. Others simply responded that they do not dispose of apparel very often or rarely, which potentially indicates that disposal is brought on as needed on an item-by-item basis rather than a habitual cleaning. Explanations for disposal varied greatly by the item, but were most often related to the concept of the item being damaged beyond wearability; items such as socks and underwear tended to be disposed of most often, while jeans, shirts, and seasonal wear were likely to stay in the wardrobe for a longer lifecycle. Participant 9 explained how her disposal decisions are made on an item by item basis,

It definitely depends on the item and how easily it’s worn out. Socks tend to go pretty quick vs. a pair of jeans which can last quite a while and go from nice to casual to work or even be cut off into shorts. I usually get a pretty good amount of wear out of my clothes, easily 30-50 times I would guess.

While Participant 8 explained her seasonal method of wardrobe turnover,

I try and go through my clothes at the beginning of each season. So for the fall season, I went through my clothes about a month ago and got rid of all the clothes that I no longer liked the style of, didn't fit, or are ruined. Unless something gets ruined when I wear it, I usually dispose of clothes four times a year (beginning of summer, fall, winter and spring).

As a final effort to understand what was considered worthy of disposal the researcher requested participants submit a photo of an item that they planned to dispose of, surprisingly the response was unanimous among participants that they did not have any items currently that they planned to dispose of because they had already done so. It is possible that the lack of items for disposal was due to the timing of this request, as it was not at the beginning of a new season or semester, or that participants were quick to dispose of an item once the need was determined.

Conclusions drawn from Participants' Apparel Storage, Repair, and Disposal Behaviors

The data related to the participants' apparel storage, repair, and disposal behaviors revealed a number of findings important for the next steps in the research and design process. For example, each participant noted a lack of adequate apparel storage. This finding reveals an area for improvement and could inspire the design of garments which are able to be stored more simply or within a limited storage space. Additionally, transitional garments would allow participants to make greater use of their current storage space. Participants' responses to apparel care questions revealed that apparel care is a learned behavior. Some participants indicated a feckless attitude towards apparel care and storage. Thus simplified care methods would reduce the consumer care process and potentially lengthen the lifecycle of an apparel garment. This conclusion was considered by the researcher during design ideation and refinement. Additionally, participants' responses were split regarding apparel repair and alteration. It is possible that the youth of this market limits the accessibility of such services due to financial burden, thus designs which can be simply altered to improve fit or style without actual construction knowledge would be ideal for this target market. Participants also gave split responses regarding the concept of apparel re-design, this possibly indicates that garments designed for user interaction should be highly intuitive without additional apparel construction or sewing knowledge necessary. Participants' disposal behaviors additionally indicate that the target market is likely to maintain a garment within their wardrobe for a lengthened life cycle as long as the garment still functions both aesthetically and physically, this conclusion influenced the researcher's decision to seek out modular design methods which would allow users to only dispose of the damaged apparel component.

Target Market's Ideal Apparel Characteristics

From the analysis of the online data, the researcher identified the participants' ideal apparel characteristics. These ideals are specific to the target market audience of full-time female students at a Midwest University, between the ages of 18 and 25, who are either unemployed or part time employed with an average monthly income of between \$0 and \$1,200. The ideal apparel characteristics define participants' current attitudes and behaviors related to apparel as explored through research objective one. These characteristics, identified by the researcher during data analysis, are a synthesis of various comments and discussion points made by participants during the online ethnographic journals; the participants did not review or refine these characteristics. The summarized statements included within the ideal apparel characteristics influenced the development of design ideation which was conducted during the next stage of the research study.

The ideal apparel characteristics, a summation of the first research objectives findings, determined by the researcher are:

- Apparel that is expressive of personal style.
- Apparel that is versatile within existing wardrobe.
 - Apparel that utilizes classic style lines.
- Apparel that adds variety to existing wardrobe.
 - Apparel that allows style variation
- Apparel that is physically comfortable.
 - Apparel that is not revealing.
 - Apparel that is properly fitted.
- Apparel is appropriate for several commonplace environments.

- Apparel that is adaptable for various activities.
- Apparel that is adaptable for various temperatures.
- Apparel that is adaptable for various social settings.
- Apparel that fulfills both utilitarian and hedonic motivations.
- Apparel that is convenient to acquire.
- Apparel that is inexpensive.
 - Apparel that is inexpensive to acquire
 - Apparel that is inexpensive to care for.
- Apparel that is easily maintained.
 - Apparel that is laundered at home.

Research Objective Two: Identify Current Environmental Attitudes and Preferences of Young Adults who are Potential Sustainable Apparel Consumers

In this thesis, the second research objective was to identify the current environmental attitudes and preferences of young adults who are potential SAC. This research objective served to inform the researcher of current environmental attitudes, thought patterns, motivations, and behaviors of potential SAC within the Millennial generation. The researcher developed possible associations and conclusions from the responses in order to further understand behavioral decision-making. Presentation of the findings begins with participants' knowledge and current environmentally friendly practices, then participant's knowledge of sustainable practices within the apparel and textile industry is presented. The chapter concludes with a summarizing list of the target market's ideal sustainable apparel characteristics derived from the findings of

Objective2. This list is further simplified to the development of a single overarching sustainable apparel guideline before the chapter conclusion.

Participants' Eco-conscious Knowledge and Practices

In order to determine the participants' level of knowledge about and interest in living eco-conscious lifestyles, as well as the level of effort they were willing to put towards living eco-consciously, the researcher posed, via the online ethnographic journal, a series of environmentally focused questions initially unrelated to apparel (see questions 48-55 in Appendix A). Questions also related to the participants' general knowledge of environmental issues and eco-conscious lifestyles. Analysis considered not only the amount of information given in the response but also the specificity with which the participant responded.

At the onset of the research study, within the initial demographic data collected during the informational meetings, participants were asked to self-identify as either eco-conscious or not, and were later asked to describe what they believed qualified them as such (see demographic data survey in Appendix A). In answering this question, eight of the ten participants identified themselves as eco-conscious. Participants who self-identified as eco-conscious were later asked via the online ethnographic journal what they considered to be eco-conscious about their lifestyles. To illustrate,

Participant 1 (self-identified as eco-conscious): I consider eco-conscious to be showing concern for the environment. I do care about the environment and have recently started recycling.

Participant 2 (self-identified as eco-conscious): I would just say that I am aware that many resources are being taken for granted and not preserved. Things are not being used/reused to their full potentials. I try to keep these statements in mind. I recycle, and reuse what I can, or know how to.

As participants were able within their response to describe multiple behaviors or attitudes that they considered eco-conscious, comments contained multiple themes that the researcher then coded and counted. For example, three responses noted an awareness or knowledge of basic environmental impacts. Additionally, five responses referenced recycling, four responses included purchasing products that are marketed as environmentally friendly, three responses specifically included an awareness of organic products and materials within the marketplace, one mentioned composting, and another mentioned abstaining from purchasing products made from animal by-products.

Concurrently the two participants who earlier self-identified as not being eco-conscious were asked via the online ethnographic journal what they considered eco-conscious to mean. One participant was considered to have been non-responsive to the question, as her response indicates that she may have misinterpreted the question to refer to economics. The second participant, through her explanation of what she believes eco-conscious to mean, indicated that by her own definition she does behave eco-consciously to a degree. To illustrate, Participant 6 explained, “I consider eco-conscious people those who take into account the products they use in regards to the environment. I buy eco-friendly bathroom products.”

Via the online ethnographic journal the researcher also asked the participants follow-up questions regarding the products that they recycle or re-use, as well as, eco-conscious products that they purchase. When asked what they recycle six materials were mentioned by at least two of the ten participants: plastic, glass, paper, cardboard, cans, and grocery bags. An individual participant mentioned four other materials. These less common materials were eyeglasses, cellphones, water, and clothes (see Figure 3). When asked about the method and frequency at

which they recycled, participants mentioned recycling individual items as they are used, when recycling services are available, or recycling large amounts on a weekly or monthly basis by delivering the goods to the recycling center. Participant 5 noted a recent improvement in her recycling habits and attributes it to increased availability of recycling services, “Now that I moved here and there’s a better recycling program, I recycle a lot more. I try to drop off recycling twice a month or so. I do most of my recycling on campus since the bins are everywhere.” Often noted simultaneously with recycling as an eco-conscious behavior, was the concept of re-using or re-purposing. However, when asked what the participants re-used, very few responses were garnered. At a rate of two responses the re-use of plastic grocery bags was the most commonly mentioned.

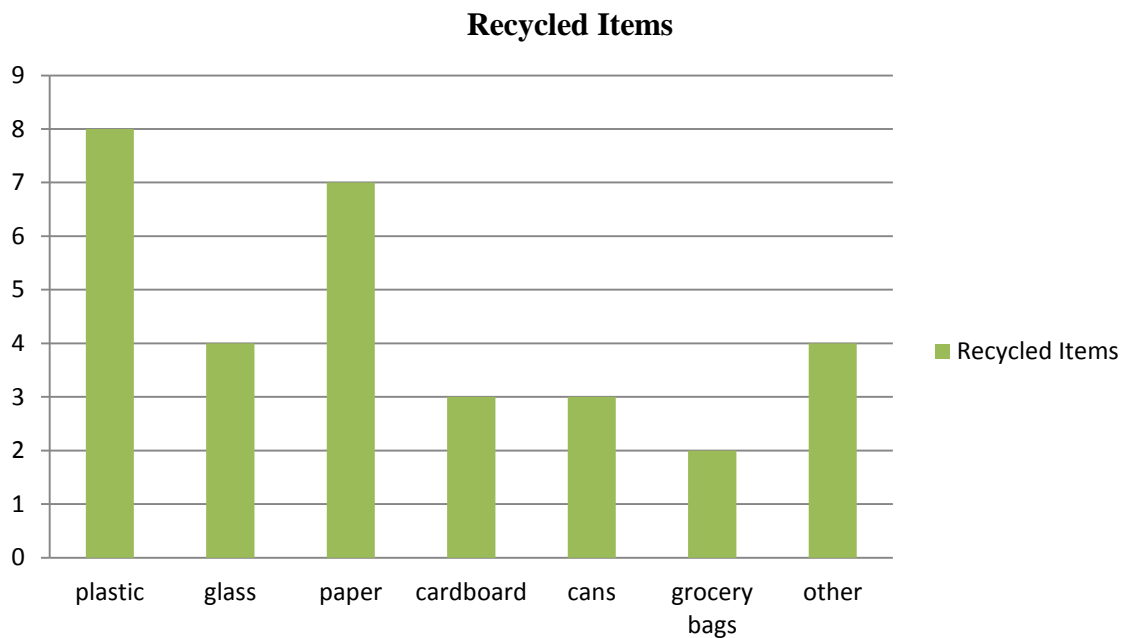


Figure 3. Comparison of recycled items most commonly reported by participants

When asked, via the online journal (see question 53 in Appendix A), if they purchase organic products, three participants mentioned purchasing organic food, one of whom along with one other participant mentioned purchasing organic beauty/skincare products. Of the nine total responses, only four participants mentioned organic apparel, unfortunately each of the four specified that they had never purchased any organic apparel. When asked why participants do not purchase organic products, reasons included perceptions that organic products would be expensive (n=5), unfamiliarity with where to find organic products (n=4), and the perception that organic products are not better for the environment and human health (n=2). When asked why participants do purchase organic products, two participants mentioned their attempt to avoid harsh chemicals in their food or clothing, one of these participants also mentioned a desire to support local or small farms and fair trade organizations which are sometimes associated with organic products. Participants were also asked what other eco-conscious products they purchased. Of the six participants who responded that they have purchased other products, responses included: biodegradable or recycled paper products (n=3), beauty or skincare products (n=2), household cleaners (n=1), pet food and toys (n=1), products that cause no harm to animals through material acquisition or testing (n=1). Four participants did not reference the use of any other eco-conscious products within their response. The three product categories that were most often mentioned by participants between both organic and environment-friendly products purchased were beauty/skincare, paper products for the home (toilet paper, paper towels, plates, napkins, etc.), and food (see Figure 4).

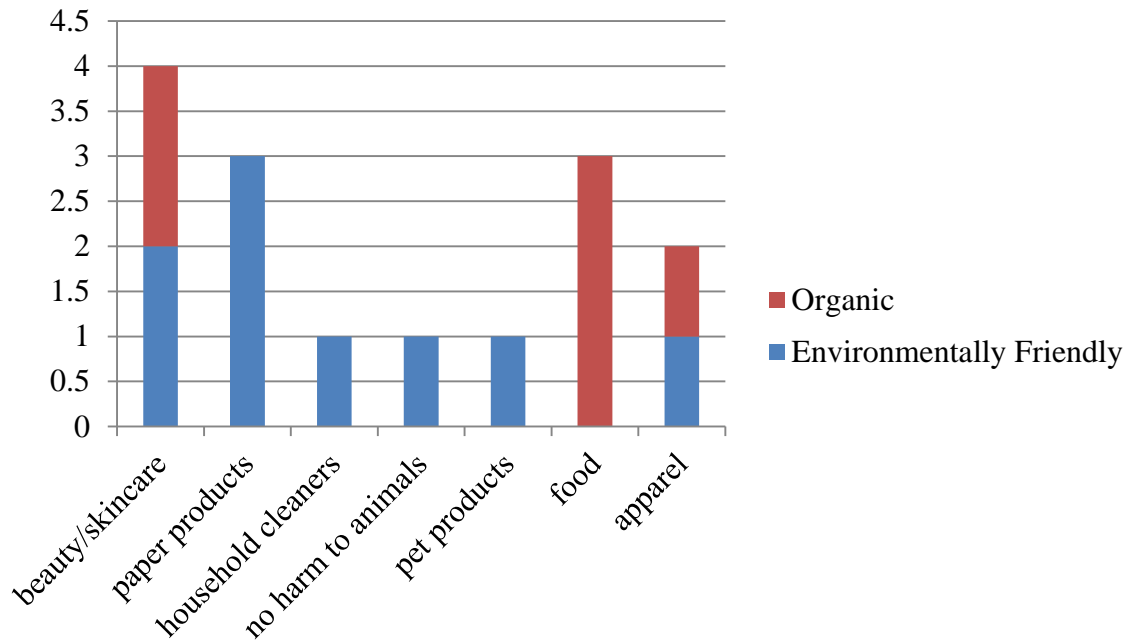


Figure 4. Comparison of organic and environmentally friendly items most commonly mentioned to have been purchased by participants.

The researcher also asked participants what they knew about the current state of the environment (see question 52 in Appendix A). Participants were unable to provide specific examples, but vague awareness was mentioned of issues such as, overcrowding (n=1), exhaustion of natural resources (n=3), littering (n=4), oil spills (n=2), and overflowing landfills (n=1).

Conclusions drawn from Participants' Eco-conscious Knowledge and Practices

Participants' responses indicated relatively little understanding of the effect of human behaviors on the environment, particularly consumer behaviors; which could indicate that environmentally sustainable apparel does not necessarily need to be marketed as such to increase its adoption among the target market. An unintentional result of this series of questions and responses was that the researcher learned more about what limitations the participants perceived

as preventing more environmentally sustainable behaviors. Participants believe environmentally preferable/organic products will cost more, which may prevent the participants from even engaging in shopping for environmentally preferable products. Participants indicated that they are more likely to actively recycle items when it is conveniently available, which also relates to their remarks regarding the availability of environmentally preferable products. These conclusions were later considered during the design ideation and refinement stage of the apparel product.

Participants' Knowledge of the Apparel Industry and Apparel Sustainability

Via the online ethnographic journal, the researcher posed questions regarding sustainability within the apparel industry (see questions 56-61 in Appendix A). The purpose of this category of questions was to discover what the participants knew about the apparel industry and its effects on the environment, as well as to determine whether the participants ever associated their apparel related habits with an environmental impact.

When asked what they knew about apparel production, only two participants' referenced apparel production at an industrial level. Participant 2 explained, "I know how to hand sew and how to use a machine at a beginner level, and I know the clothes I buy are made in large bulk." Meanwhile, Participant 8 admitted, "I do not know hardly anything about apparel production. I'm not sure what goes into making/designing apparel." The remaining responses were either in reference to home sewing production or simply an admittance of no prior knowledge regarding apparel production. Participants were also asked whether they knew of any environmental or social impacts caused by the production of clothing. Two participants admitted that they did not know of any and did not provide any guesses at possible impacts. Of the other responses, three mentioned factory pollution (two specified air pollution), two mentioned child labor laws (one in

reference to historical textile production); the same two participants also noted working conditions. Participant 8 who previously admitted she had little to no knowledge of apparel production suggested, “The only environmental impact I can think of that could be caused by the production of clothing would be pollution from warehouses and factories.” One participant pondered the possible waste of clothing by celebrities who rarely wear the same garment more than once. Participant 5 addressed the most issues in her response,

When I think of apparel production, I always think of overseas sweatshops and workers that work 16 hours a day for little money. Back when textile production began, factories employed children since they were smaller and could fit between the machines. A lot of children were maimed or killed by the machines or even died from the exhaustion of working 18 hours a day, 7 days a week. This brought on awareness of poor work conditions and legislation was passed to protect children.

When asked which fabrics or materials participants believed to be more environmentally preferable, seven of eight respondents admitted that they did not know, were unsure, or had never considered the question before. Of those, two suspected that “natural fibers” would be more environmentally friendly, for example, Participant 8 shared, “I am not sure what fabrics/materials would be more environmentally friendly than others. Perhaps ones that require less manufacturing and are more natural.” Three guessed that cotton seemed like a very strong possibility as an environmentally conscious material, including Participant 7 who suggested, “I have no idea. I would guess that cotton would be more environmentally [friendly] than synthetic materials.” and two participants simply did not know or make any speculations. Only Participant 5 responded with some confidence that materials such as cotton, wool, or fleece were preferable because of their natural feel and durability, stating “I prefer simple materials such as cotton, wool and fleece over spandex, leather and fur. They feel more natural and last longer to me.”

When asked if participants could list any apparel brands that they believe were eco-conscious, seven of eight responding participants could not list any brands. One participant was able to list two brands that she believed to be environmentally responsible. Additionally, this same participant, along with one other, was also able to name a brand that they believed to provide social support to communities.

Participant 3: I honestly don't know if I know any eco-friendly brands. I do know brands that go for a cause, such as Toms, which I think are a great way to use fashion for a good cause, which I am all for.

Participant 5: Feral Childe uses sustainable materials and disposes of their waste responsibly. Awamaki Lab helps impoverished women weavers in Peru make a living. They use sustainable, local materials and everything is hand woven (no electricity).

The researcher also asked participants when shopping for apparel, what might make them feel like they are “doing good” or contributing to a social or environmental cause. Two participants admitted that they had never really considered this concept, though one suggested that she feels as though she is “doing good” or contributing to a social or environmental cause by purchasing a product of which she actually utilizes. Participant 9 shared, “If I’m purchasing from a consignment shop, I feel like I’m using something that still has use to it, instead of it getting thrown out.” Three participants recognized that purchases that support a corporate donation to a cause made them feel good. Two responses included purchasing clothing that is organic or environmentally friendly, and one also noted an avoidance of natural animal furs. A final participant recognized a purchase from a local street artisan as a positive experience.

Participant 2: ...I guess I felt like I was contributing to a cause when I bought a sweatshirt woven by someone in Guatemala off the street while I was there, rather than a mainstream producer.

Participant 8: I feel good about purchasing certain clothing items if the money generated from the sale goes to a good cause. Ex: breast cancer clothing with the pink ribbon, Toms shoes (for every pair you buy, they donate to a child in need.)

Finally, through the online journal, the researcher asked the participants if they would like to learn more about the apparel industry and the environment. Four participants mentioned a desire to know more about fabrics and materials, particularly environmentally preferable options, for example Participant 1 shared, “I’m interested in learning more about what materials are environmentally friendly and where you buy organic clothes.” Three participants were interested in learning more about which brands sell eco-conscious apparel and where to find eco-conscious options. Participant 2 desired to learn more about how she could dispose of her clothing in a more environmentally conscious manner, explaining, “I would like to know how clothes are disposed of, because I don’t really dispose of clothes. And what harm the clothes are doing to the environment.” Finally, three participants simply sought more knowledge about the environmental impact of the apparel industry and what apparel companies are doing to reduce impact. Participant 8 shared, “I am interested in knowing what fabrics are more environmentally friendly and how I can be more conscious of the environment by choosing better clothing options.” The researcher did not follow-up to provide answers or responses specifically to the participants’ interests. However, a short informal presentation during the first focus group, did provide a general overview regarding sustainability within the apparel industry and lifecycle.

Conclusions drawn from Participants’ Knowledge of the Apparel Industry and Apparel Sustainability

Participants expressed an interest and eagerness when discussing environmental stewardship. Yet their efforts to gain knowledge and participate as environmental stewards are seemingly minimal. The participants admit to having very limited knowledge of the apparel

industry, some even mentioned they had never considered the procedures or scale of clothing production. Additionally, it is apparent that the participants give very little consideration to the environmental impact of the apparel within their wardrobes. However, they did indicate an interest in gaining more knowledge regarding various environmental elements of apparel production.

It is important to note at this time, that the sample used within this study, may not reflect all values previously listed as being characteristic of the Millennial generation. Additionally, as this sample is quite young, their ages fall at the end of the Millennial generation, which may prevent them from fully partaking in behaviors that they appreciate such as purchasing more environmentally preferable products. Additionally, this sample may not have yet developed the knowledge and experience that would influence such values.

Target Market's Ideal Environmental Apparel Characteristics

From the analysis of the online data the researcher identified the participants' ideal environmental apparel characteristics. These ideals are specific to the target market audience of full time female students at a Midwest University between the ages of 18 and 25, who either are unemployed or part time employed with an average monthly income of between \$0 and \$1,200. The ideal environmental apparel characteristics were uncovered from participants' current attitudes and behaviors related to the environment and environmentally preferable products as explored through research objective two. Ideal environmental apparel characteristics identified by the researcher from the collected data are:

- Apparel that reduces the amount of textile thrown away when a garment is damaged.
- Apparel that utilizes recycled fibers.

- Apparel that utilizes environmentally preferable natural fibers without added cost.

Chapter Five Conclusion

Ten female students between the ages of 18 and 23 participated in this research study. The backgrounds, interests, academic studies, and activities/hobbies of these participants varied. All of the participants were full-time students at the mid-western university where the research occurred. The sample was evenly divided between unemployed and part time employees and the average monthly income ranged from \$0 to \$1200, with an estimated \$0 to \$150 spent on apparel purchases each month. Of the 10 participants, eight responded that they consider themselves “eco-conscious.”

In addition, presented within this chapter were the findings and conclusions relating to research objectives One and Two. To fulfill research objective one, the researcher sought to identify current apparel attitudes and consumption behaviors of female young adults who are potential SAC. This effort occurred through the collection of data via the daily online ethnographic journal, and was enforced through in-person communications during the first focus group sessions.

The second research objective, the researcher sought to fulfill was to identify current environmental attitudes and preferences of female young adults who are potential SAC. Similar to research objective one, this effort began through the collection of data via the daily online ethnographic journal, and continued through in-person communications during the first focus group sessions.

Finally, to guide the design process, the combination of ideal apparel characteristics and ideal environmental apparel characteristics led the researcher to develop a single overarching environmentally sustainable apparel design guideline:

Apparel utilizing environmentally friendly natural or recycled fibers that is able to provide variety by being updated or transitioned in an inexpensive, convenient manner and with minimal effort or time resulting in less waste at disposal.

Not all ideal characteristics were included in the researcher developed overarching guideline due to the inherent relationship between one characteristic and another and the limitations of the study's size and timeline. The research later utilized the developed ideal objectives and overarching design guideline throughout the design process ensuring that the research was true to the target market's desires, capabilities, and habits throughout the design ideation stage.

Chapter 6 - Analysis of Objectives Three and Four

This chapter presents findings and discussion related to the study's third and fourth research objectives. The third objective was to generate sustainable apparel design strategies based on the analysis of collected qualitative data. Then, the fourth objective was to design and develop an environmentally sustainable apparel product, by applying the generated sustainable apparel design strategies. Thus, division of this chapter is into two parts: presentation of the findings related to research objective three and then presentation of the findings related to research objective four. In order to substantiate the analysis and conclusions, where appropriate, the chapter makes use of illustrative quotations from the focus group sessions.

Research Objective Three: Generation of Sustainable Apparel Design Strategies Based on the Analysis of Collected Qualitative Data.

To generate sustainable apparel design strategies, the researcher compared the data collected during the first focus group session to the researcher's existing knowledge of environmental sustainability and apparel design in order to refine participant suggested sustainable apparel design strategies. Thus, this objective combined the information gathered during the previous research stages (contextual review and collected user data), with the researcher's own tacit knowledge and design experience in order to determine the most applicable sustainable design strategy within the researcher's capabilities.

Presentation of the findings begins with an explanation of the development of the environmentally sustainable apparel design concept through participant ideation including participant design suggestions and adoption roadblocks, the refined concept, and its relation to an

existing sustainable apparel design strategy. Finally, a summarization of research objective three before the chapter proceeds to present findings related to the fourth research objective.

Conceptual Development through Participant Ideation

Following the icebreaker discussion reviewing topics and questions covered in the online ethnographic journal (see Appendix A) and free word association game (see Appendix B), the researcher directed participants to begin the “Ideate” stage of the design process. The researcher initiated ideation by presenting two pre-existing sustainable apparel design strategies to the participants via online videos and websites (Evolution Apparel, 2007; Patagonia, 2013). These strategies were a transitional garment designed for user interaction and a lengthened life cycle strategy designed for product-service systems. Following the presentation of existing sustainable apparel design strategies, participants began to brainstorm and discuss potential sustainable apparel design ideas that the research study could develop¹. Potential sustainable apparel design ideas generated through researcher and participant discussion during the first focus group sessions included:

- A. Outerwear garments designed with layers that can be removed or added to improve the versatility of the garment.
 - a. Thin insulation layers that can be removed or added, due to temperature variation, without detracting from the appearance of the garment.
- B. Garments that can be transitioned into multiple styles or types of garment.

¹ As an environmentally sustainable apparel idea was often developed over the course of discussion, or a widespread series of comments throughout a session made by multiple participants, exemplar narratives have not been given within this section.

- C. Garments that can be adjusted in length, depth of neckline, or fit for transition from day to evening.
- D. Accessory garments that can be converted into alternative accessories to be worn on different parts of the body.
 - a. Hidden transitional mechanisms that do not detract from the garment style.
 - i. Drawstrings, elastic cords, zippers, or buttons hidden within seams.
 - b. Intuitive garment transitions with instructions or examples provided.
 - c. Elements that are detachable should not be a size which is easily lost.
- E. Detachable or interchangeable elements, such as collars, cuffs, pockets, or badges.
- F. Reversible garments that feature two different fabrics or colors.
- G. Temperature sensitive textiles that can be reset during the wash cycle, and heated to set a desired color during the dry cycle of laundering.
- H. Disposable garments designed for a single use.
- I. Garments that require less frequent laundering.
- J. Garments created from previously used clothing or textiles.

Although the third research objective was to generate sustainable apparel design strategies, during the focus group brainstorming, the participants primarily made suggestions specific to particular garments and not relevant to broader strategies of sustainable apparel design applicable across a spectrum of garments. In seeking to understand this direction, the researcher assumed it was due to the participants' minimal apparel design experience and knowledge of environmental sustainability. Therefore, in order to extract the sustainable apparel design strategy that was implicit in the participants' apparel design ideas, the researcher further

refined the ideas during data analysis through the lens of her apparel design experience and environmental sustainability knowledge. These underlying sustainable apparel design strategies could potentially be applied to a broader range of apparel items than the particular garment suggested by a participant. For example, many of the ideas suggested by participants during the first focus group session included methods of transitioning or transforming the appearance or function of a garment, which is characteristic of the Design for User Interaction strategy (see Chapter 2). The identification of a common sustainable apparel design strategy consistent among participants' ideas led the researcher to focus on a transitional or transformable design concept as she further ideated on the application of those suggestions.

Participant identified roadblocks. Further discussion during the first focus group led to participants simultaneously determining potential roadblocks of environmentally sustainable apparel design acceptance by general consumers. This discussion occurred in reaction to ideas presented during the ideation portion of the first focus group sessions. Participant identified potential roadblocks included:

- Consumers may be unwilling to reduce the frequency of garment laundering due to pre-existing social norms.
- Consumers may be unwilling to reduce the amount of apparel they purchase due to pre-existing habits and attitudes.
- Consumers may be unwilling to extend much effort to transition a garment on a regular basis.

These roadblocks were expressed in comments by participants 5, 8, 1 and 2:

Participant 5: I think one of the biggest problems we face is that it is such a big habit for us to just go out and buy something once we need it... You can have a great jacket which might keep you warm and be everything you need, but then you're going to pass by that store and see that one cute jacket that's a pea coat or a trench coat or something and maybe it's not heavy duty but it's so cute and you want it. I think until we can get our spending addiction under control, it would be really hard to cut down on waste and try to give them a new product. They might buy the purse that charges your phone but they're also going to buy that \$2,000.00 Coach purse, too.

Participant 8: My mom said, "I can't believe you spent that on one coat." And it's like, "Yeah but how many coats have you bought in the last year?" She goes out and buys like a fleece [jacket] cause it's maybe like \$5.00 but she goes through like 10 of those in one winter. I really think people in our culture have a big thing about quantity as opposed to quality. They don't think about the cost that will go into all the other items. They're just worrying about that immediate upfront cost.

Participant 1: The one thing I worry about with that [apparel that utilizes textiles that do not require regular laundering], and I really like the idea and I know it would save a lot of water and all those detergents and chemicals and the energy for drying. But I think that people might be kind of grossed out that they're not washing their clothes. And you don't want to be like, "Oh. Guess what, I haven't washed my shirt in two weeks." You know. Cause your friends might kind of get grossed out by that. So I think that's like a social issue. So it might not catch on.

Participant 2: If it came with a little manual with different ideas, and I think if it was easy to switch it because if it got too difficult I don't think that many people would like to spend time trying to figure it out.

The identified roadblocks served as a reminder throughout the design process as the researcher sought to design a garment that would not be beyond normal expectations and consumer comfort levels as identified by the participants.

Environmentally sustainable apparel design concept. The researcher advanced participants' apparel design ideas into a combined environmentally sustainable apparel design concept for application to the development of a sustainable apparel product during the remainder of the research study. As previously mentioned, the researcher focused efforts on the development of a transitional or transformable garment, exploring an application of the Design

for User Interaction sustainable design strategy. The environmentally sustainable apparel design concept falls within the existing sustainable design strategy Design for User Interaction, introduced in chapter 2. Design for User Interaction allows the consumer to feel both an empathetic connection to the garment, as well as, fulfill the need for uniqueness with specialized designs, or transitional garments. In theory, users will feel a more empathetic connection to clothing that they are able to manipulate or customize to their own requirements or desires. Further, because modular or transitional garments can be adjusted by the wearer they eliminate the utilitarian need for additional clothing items from the user's closet.

The environmentally sustainable apparel design concept was:

Garments designed to be versatile through various temperatures, social settings, and environments. Garments designed for temporary transition of functional and aesthetic elements including hem length, neckline, and sleeves possible through the use of hidden mechanisms. Further transitional ability should allow the garments to be layered for greater thermal insulation without detracting from the appearance of the garments.

The combination of participants' apparel ideas in this manner served to utilize as many related ideas as possible. However, the researcher did decide to exclude some ideas and ideal apparel characteristics from the environmentally sustainable apparel design concept in order to progress the study in a timely manner within the capabilities of the researcher and available funding

Researcher Reflections on the First Focus Group

Researcher reflection of the first focus group brought to light several issues of importance, including:

- The nature of qualitative research allows only a limited amount of preparation; this situation caused additional pre-session nerves on the part of the in-experienced researcher.
- Future experimentation with focus group methods may aid in the development of a more engaging experience for participants, the first focus group session did not engage participants in hands-on ideation.
- Participants seemed to be interested in the topic and comfortable with discussion of current attitudes and consumption behaviors, particularly after prompting or a personal anecdote from the researcher.
- Prior to seeing the online examples of sustainable apparel design, participants were unable to ideate potential environmental apparel design strategies. The examples, helped participants begin discussion that led to ideation. However, in hindsight the researcher believes she might have influenced the type of suggestions offered by participants, as many were related to transformable design.
- Participant ideas were not exceedingly original; many ideas were comparable to existing apparel designs of which the researcher was familiar with due to the contextual review.
- The researcher noted feelings of disappointment and frustration with the lack of original ideas suggested by the participants. The researcher's expectations for the benefits of a random sample from various disciplines and life experience, was that participants could input solutions or draw similarities to their own fields in order to suggest original and creative environmental apparel design strategies or concepts.

These reflections indicate a degree of uncertainty regarding the effectiveness of focus group activities on the part of the researcher, perhaps additional opportunities to prepare and test the activities of the focus group would aid future research. Additionally, while the focus group was a successful experience that led to a good discussion of the desired topics, the participants' responses did not produce original sustainable design strategies; due to the participants' experience level on the subject area, the researcher's committee members actually anticipated this outcome. However, the researcher had hoped for more original concepts as the participants drew inspiration from their own disciplines and tacit knowledge. It is possible that, due to the participants' young age and relatively new experience within their fields, that they did not yet have the confidence or foundational background to apply existing knowledge as a solution within another discipline.

Objective Three Summary

In an attempt to satisfy research objective three, the generation of sustainable apparel design strategies based on the analysis of collected qualitative data, participants became engaged in the ideation stage of the design process during the first focus group session. Participants suggested potential sustainable apparel design ideas that included the identification of potential environmentally sustainable apparel adoption roadblocks. From the participants' ideas, the researcher, utilizing her tacit knowledge and design experience coupled with the sustainable apparel design guideline, developed a refined environmentally sustainable apparel design concept. The developed environmentally sustainable apparel design concept is representative of a pre-existing sustainable apparel design strategy, Design for User Interaction.

It is important to note that this study did not satisfactorily complete research objective three, the generation of sustainable apparel design strategies because the participants were unable

to express ideas regarding sustainable apparel design strategies that were applicable to a spectrum of garments. Instead, they primarily expressed sustainable apparel design ideas related to individual or experimental garments. This does not necessarily indicate that there is no room for further strategy development; rather the researcher believes that the inclusion of participants with limited pre-existing apparel design and environmental sustainability knowledge decreased the potential for strategy development. Furthermore, it is highly possible that the participants focused on the concept of transformable garments after viewing the example video presented by the researcher during the first focus group. However, this may also indicate that the participants perceived room for further exploration in the utilization of transformable apparel design, supporting the relevance of the existing strategy, Design for User Interaction.

For the remainder of this thesis, the term “strategy” refers to the existing strategy Design for User Interaction, previously defined by Gwilt and Rissanen (2011); and the term “concept” refers to the summation of participants’ design ideas generated during the first focus group and refined by the researcher.

Research Objective Four: Design and Develop an Environmentally Sustainable Apparel Product, through application of the Sustainable Apparel Design Strategy.

The fourth research objective was to design and develop an environmentally sustainable apparel product, by applying the participant generated and researcher refined environmentally sustainable apparel design concept. Objective Four allowed the researcher to examine and apply the generated concept through the progression of the design process to an apparel garment prototype. This occurred through multiple iterations of a sketch concept, then the development of

two iterations of an apparel garment prototype, the second of which the participants evaluated during the third focus group session.

Presentation of findings relevant to objective four begins with description of the researcher propelled design ideation that occurred between focus group sessions one and two. Then a presentation of the refinement of the apparel design through the feedback gained during focus group two. Next, the section reports a stage of researcher propelled design refinement. Finally, the section concludes with prototype development and a summary of the findings relevant to the objective.

Researcher Propelled Design Ideation

Following the first focus group session, the researcher continued within the “Ideate” stage of the design process through sustained brainstorming and idea generation. The researcher considered the participants’ sustainable apparel design ideas in combination with the researcher defined ideal environmental apparel design guideline. The researcher refined the ideas through intuitive design development in order to determine weaknesses and feasibility of the participant-generated ideas, supported by the researcher’s pre-existing tacit knowledge and apparel design experience. Meetings with the researcher’s mentors further explored and developed the participant-generated and researcher-refined concepts. The mentor meetings provided additional experience and tacit knowledge of environmentally sustainable apparel, occasionally advancing or eliminating potential apparel design concepts (due to limitations of the study including the length of the study, financial support, and capabilities and knowledge of the researcher). This period of researcher ideation and refinement occurred over a period of ten weeks.

Between focus group sessions one and two, the researcher maintained a valid and reliable understanding of the participants’ interests and suggestions by continuously referencing the

focus group transcriptions, notes and photos taken during the first focus group session, and the researcher's interpretation of the participants' ideal apparel objectives. The researcher also maintained a design journal involving researcher notes and summations, mentor critique and suggestions, photographic and illustrative evidence of design progression and prototyping, as well as, potential material sources and purchase receipts.

Conceptual Design Refinement

At the conclusion of the ten-week period between focus group sessions one and two, the researcher met with participants for the second focus group session, where she presented a computer-generated sketch concept that she believed to be the strongest application of the combined participants' ideas within the context of the ideal environmental apparel design objectives. The selection of a single apparel garment for prototype development served as a test garment for participants to further understand and visualize the conceptual strategy. The researcher applied the generated concept to the development of an outerwear garment as suggested by Participant 3 during the first focus group session. The researcher did consider applying the apparel design concept to other apparel garments (a skirt or vest), however, she decided that the development of a complex garment such as outerwear would provide increased opportunity for engagement. The selection of an outerwear garment allowed the researcher to explore various interacting aspects of the design concept and approach potential roadblocks that could prevent future adoption and adaptation of the design concept.

Following, is an explanation of the initial environmentally sustainable apparel design concept as applied to the development of an outerwear garment. The environmentally sustainable apparel design concept involved increasing the lifetime of a core layer of materials through the creation of interchangeable shell layers. Designed to surround the core layer, the shell layer

encased the core between an interior liner and the exterior fabric of the garment. The design included strategically located buttons served to align and secure the various garment layers. Through the creation of separate core and shell layers, the user could add or remove layers for comfort in different environmental temperatures, as well as, alter the style of the garment for different occasions, or seasons. Additionally, the separation of the layers decreases the materials necessary to meet the users need for variety by allowing the consumer to purchase a single core layer, and then purchase additional shell layers to achieve different styles without the need to replace all of the materials commonly needed to create an entirely different outerwear garment. Moreover, the user need only launder the layer that is soiled, rather than utilize water and energy to launder multiple layers of materials or transport the item to a drycleaner due to interior insulation layers that cannot be home laundered, such as wool or down filling. Finally, the separation of layers also provides the possibility for increased separation of biological and technical nutrients, as discussed in the second chapter, which can increase the amount of materials that are recycled or biodegraded.

During the second focus group session, the researcher was able to gather additional feedback as the participants determined areas of weakness within both the design concept and the garment sketch concept. The session began with a reiteration of the study's purpose, and a visual presentation of problem parameters that the researcher desired the participants to consider while reviewing the design concept and prototype. Problem parameters included sustainable design elements, such as material considerations, length of lifecycle, care requirements, versatility and desirability within the user's wardrobe, and elements of apparel design for a target market, such as price point and style. Following the presentation, the researcher began by describing the environmentally sustainable design concept, as described in the previous paragraph. The

researcher then requested participant feedback on the environmentally sustainable design concept; prompting participants to recall and consider the sustainable apparel design elements discussed in the presentation. The researcher then shared, on a projected screen, the first iteration of the conceptual design sketch and requested participant feedback (see Figure 5). Participants were able to make design suggestions, as well as, concept recommendations while the researcher edited the design using computer-aided design software. Participants were able to see the sketch concept on the projected screen as the researcher edited and continuously offer opinions and feedback. Iterations of the design were saved throughout the meeting, at the conclusion of the meeting, and following the researcher’s review of the focus group.



Figure 5. Conceptual design sketch: Iteration one.

Figure 6 illustrates the second sketch iteration; the changes made to the sketch reflect participant requests and were edited in the CAD software during the second focus group session. Participants suggested that the concept utilize fewer buttons to increase the ease of transition and design aesthetic, at which time the center front buttons were removed and the design became a traditional double-breasted coat. Participants also voiced curiosity at the concept of adding length to the shell layer to increase the seasonal versatility of the garment.



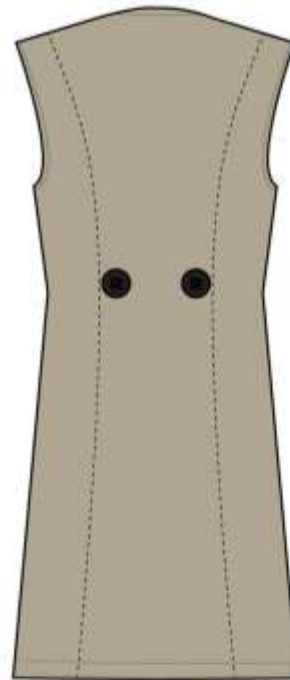
Figure 6. Conceptual design sketch: Iteration two.

Researcher Propelled Design Refinement

Following the second focus group session, the researcher met with her mentors for further refinement of the garment design and sustainable apparel design concept. Figure 7 depicts mentor suggestions. The most obvious, and easily visible suggestion, was the removal of sleeves from the core layer to ease in sleeve fit. The researcher's mentors also suggested, to increase the versatility of the garment, the development of the core layer as a stand-alone garment. This led to the development of a vest, which could serve as the thermal core layer of the outerwear garment. Additionally, the researcher discussed material selection, presenting a swatch book of organic natural fibers and sourced coconut buttons. Following the meeting, the researcher decided to pursue wool as a potential core layer due to its added warmth, and potential to provide necessary structure.



Front Core Layer



Back Core Layer



Front Shell Layer



Back Shell Layer

Figure 7. Conceptual design sketch: Iteration three.

Full Scale Prototypes

At this time, the researcher began creation of the first full scale garment prototype. The researcher developed the first core layer prototype through draping muslin on a dress form to create a double-breasted vest-style dress. The prototype was sewn from wool tweed, which was chosen due to its ability to provide added warmth and aesthetic appeal as a standalone garment (see Figure 8). The researcher also selected coconut shell buttons and 100% cotton thread to maintain the use of biological nutrients on the core layer.



Figure 8. Full scale garment prototype one: Core layer.

Mentor-led prototype refinement. After development of the first core layer prototype, the researcher returned for further feedback and suggestions from her mentors. The researcher presented a diagram that illustrated the various elements of the garment prototype, representing the various stakeholders (researcher, participants, mentors, outsiders) influence through color-coding (see Figure 9). The diagram also represented questions or roadblocks that the researcher was encountering during the design process, on which she sought advice from her mentors. One particular concern was the degree of movement that would occur between the layers, potentially misaligning the buttonholes and making the garment more difficult to transition. However, the mentors felt that through careful pattern development and garment construction this would not be an issue. The mentors did suggest the use of style elements such as shoulder epaulettes and wrist tabs to conceal additional transitional button mechanisms within the aesthetic elements of the design, which would also allow more secure alignment.

A second concern voiced by the researcher was that due to the selection of wool fabric it became necessary to line the core layer. However, the application of a synthetic lining was in opposition to the original design concept due to both the difficulty of separating the polyester lining (technical nutrient) from the wool core (biological nutrient) at disposal, as well as, the intention to attach the core within the envelop-like shell layer. The most agreed upon replacement material was recycled plastic polyester tech fleece, which is commonly used for vests and lightweight jackets worn by the target market. Additionally, the mentors recommended that, for progression of the prototype, the researcher should not be overly concerned with material selection at this stage, though later efforts would more carefully separate biological and technical nutrients for ease of recycling and biodegrading.

The mentors also voiced concerns that the core layer prototype, due to the fit, style, and length was too restrictive for potential shell layer styles. The mentors suggested that the researcher develop a more simplified, shorter vest to serve as the core layer. Illustrated reflections of these comments and suggestions appear in the sketch concept (see Figure 10), as well as, the second prototype development that participants viewed for evaluation during the third focus group session.

Following the mentor review of the first core-layer prototype, the researcher considered the suggestion to shorten and simplify the core-layer. Considering current styles worn by the target market, the researcher decided to pursue a tech-vest style. Injecting sports zippers and applying the polyester tech fleece to the design sketch.

It was during the pattern drafting stage of the first prototype development that an inspirational image found on the internet influenced the researcher (see Figure 11). At the time when the image was located, the researcher did not immediately implement the bolero transitional element into the design concept. However, this image influenced the development of the second prototype design to retain the core layer, make the shell layer sleeveless, and add a sleeved shell bolero to incorporate further garment transition, as illustrated in Figure 12.

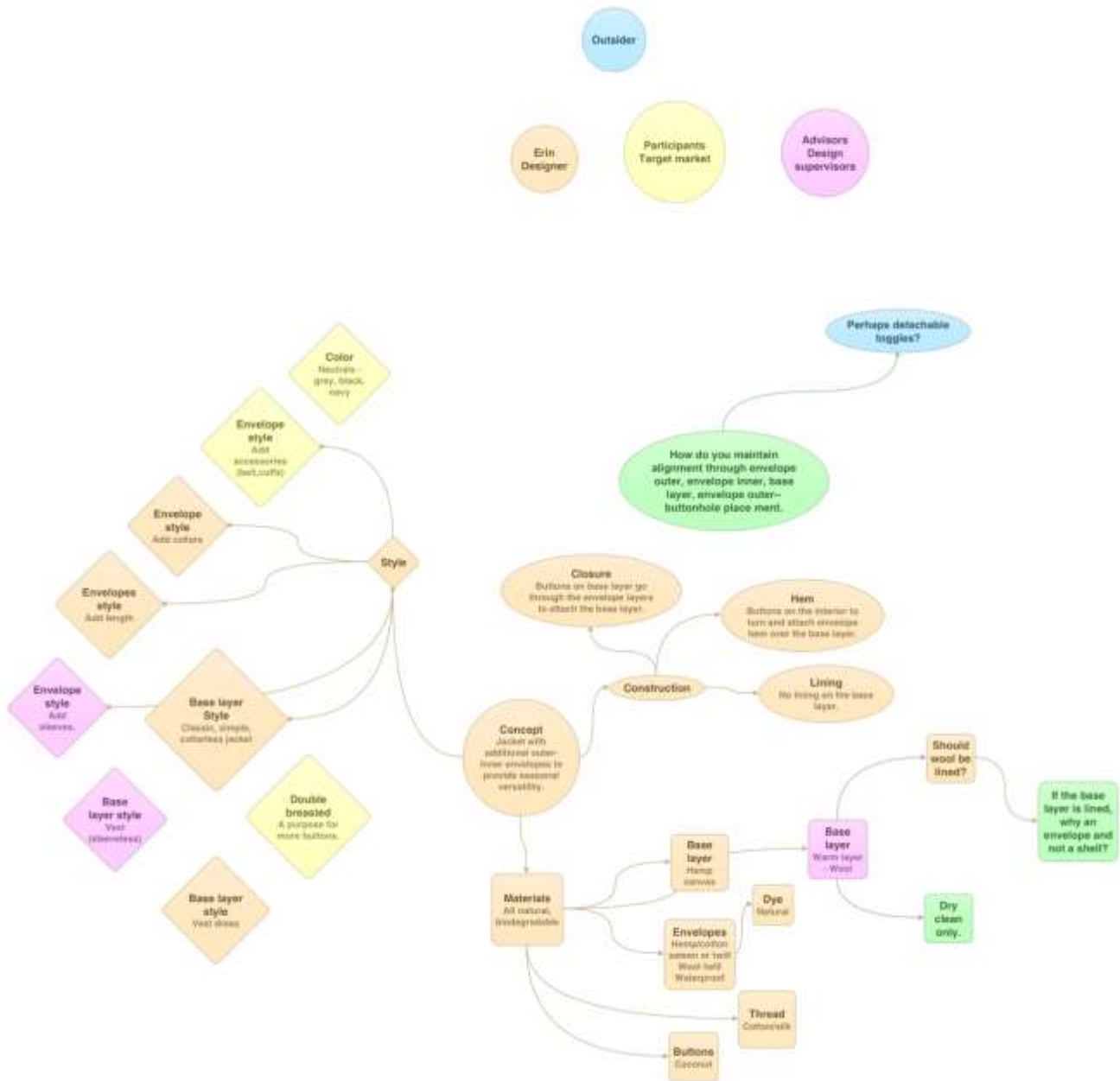


Figure 9. Elements of the garment prototype, representing influential stakeholders through colors.



Front Core Layer



Back Core Layer



Front Shell Layer



Back Shell Layer

Figure 10. Conceptual design sketch: Iteration four.



Figure 11. Inspirational image illustrating bolero shell concept.



Figure 12. Conceptual design sketch: Iteration five

Prototype two. Development of prototype two occurred through a combination of flat pattern manipulation and draping. Three separate pieces were developed to allow the greatest degree of garment transition, a vest core layer, a trench coat shell layer, and a sleeved bolero jacket.

The core layer materials were gray poly-fleece fabric, with black poly-cotton twill tape, and black nylon sport zippers (see Figure 13). The design replicated fleece active wear vests commonly worn by the target market. In order for the fleece core layer to function within the overall garment concept, the researcher added buttonholes on both sides of the zipper, the shoulder seams, and the center back at shoulder level. The excess of buttonholes allowed for secure alignment between interior and exterior layers of the double-breasted trench coat shell. All buttonholes were sewn with a thread color that matched the fleece color.



Figure 13. Prototype two: Core layer.

The materials comprising the trench coat shell were a camel cotton twill, lined with printed cotton broadcloth, and a D-ring belt buckle. When worn together, the shell and bolero offer the classic trench coat design elements (see Figure 14). Unlike a traditional lined garment, the shell-lining attaches to the exterior fabric along the center front seams and neckline only, allowing the core layer to slide in between the lining and exterior layers. During construction of the trench coat shell, the need for an additional element of the design concept became apparent: removable closures for the front of the double-breasted trench coat.



Figure 14. Prototype two: Shell covered core layer.

Due to the multiple layers of the garment, the closure became an apparent issue. Thus the researcher, with peer input, developed a new closure mechanism, interchangeable button fasteners. This element of the design concept represented a participant's idea regarding transitional style elements mentioned during the first focus group. As an additional application of the concept within the Design for User Interaction strategy, the interchangeable button fasteners provided the user with opportunity to influence the expressive elements of her garment. Each fastener was comprised of two buttons, of different styles, separated by an elastic band. The elastic band allowed the buttons to secure multiple layers of the prototype garment while maintaining a snug fit. The different styles of buttons allowed the user to alter the garment style through a simple manipulation of the buttons, similar to the application of cufflinks.

For the purpose of the conceptual design, additional buttonholes combined with the dual button elastic fasteners provided secure alignment of the overlapping double-breasted trench coat through all layers. Permanently attached buttons, sewn to the interior fabric lining, aligned with buttonholes sewn in each layer of the garment creating secure points at the cuff, shoulder seam, and high center back. Each bust point also received a permanently attached button securing the front flaps of the bolero jacket.

Another element of the shell layer was the duvet cover-like button closure sewn across the bottom hemline. To create the hemline closure, buttons were sewn to the interior layer with aligning buttonholes stitched to the inside of the folded exterior hemline, thus making these buttons invisible to the viewer. The security added by joining the lining and exterior fabric at the hemline assures that an outside viewer would be unable to identify the unusual design and function of the garment.

The sleeved bolero jacket materials were the same as those used to construct the sleeveless shell layer, camel colored cotton twill and a printed cotton broadcloth lining. Design elements included shoulder epaulettes, wrist straps, and an extended collar. Buttonholes sewn in the shoulder seam and epaulettes allowed for the pass through of permanently attached buttons sewn to the sleeveless shell lining, securing together the multiple layers. Buttonholes at the wrist, disguised by the traditional wrist strap elements, also aligned to buttons attached to the lining, securing the lining fabric to prevent material bunching within the sleeve. Finally, a center back buttonhole on the sleeved bolero jacket aligned with buttonholes sewn in the core layer, sleeveless shell and a button permanently attached to the lining. Secure points such as these, were designed to prevent material bunching or shifting between the layers. Final design elements included pockets sewn into the front princess seam lines, as well as, a center back belt loop and removable D-ring belt.

Researcher Reflections on the Design Refinement

As noted during discussion of objective three, throughout the design process, the researcher recorded reflections and observations on the design development and participatory design process. In this section, the researcher responds to her own reflections made during and following the second focus group session, including the design development through sketches and prototypes. Due to the multiple methods of recording reflections, the following bulleted list summarized the data.

- The researcher noted difficulty applying the participants' ideas in an original manner, since many of the ideas referenced apparel items that participants had experienced previously.

- In an attempt to remain reflective of the sample's ideas, the researcher postponed pursuance of other more original or unique ideas. While it was disappointing not to pursue such ideas, the decision to remain true to the participant's ideas was affirmed during evaluation stage. If the researcher had pursued other ideas more loosely influenced by the participants, it is possible that they would not have felt an empathetic connection to the design.
- The mentor meetings helped the researcher determine how to execute the design, however they often interjected new questions or ideas, which at times made it difficult to proceed as planned. In addition, there were times when the researcher did not agree with suggestions but moved forward due to time constraints or discomfort for not utilizing suggestions. For example, the researcher would have liked to pursue more material and style options for the core layer.
- The researcher struggled with designing a sustainable garment, due to the necessary revisions of prototyping. The greater number of design prototypes, resulted in increased textile waste from cut patterns.
- Finally, the researcher considered the short-term versus long-term sustainability of the apparel garment, as well as, potential larger scale applications.

These reflections allude to the difficulties encountered during the design process, particularly in the case of participatory design and environmentally sustainable design. There is no further summation or conclusion drawn here, as the bulleted points are already summations of recorded reflections.

Objective Four Summary

In order to fulfill research objective four, design and development of an environmentally sustainable apparel product, the researcher worked between stages of design ideation and design refinement. Meetings with focus group participants and mentors allowed for external review of the garment design and the sustainable apparel design concept.

The development of a garment from the sustainable design concept allowed for application of the existing strategy, Design for User Interaction. The researcher carefully considered feedback from the focus groups and mentors as the design progressed in order to maintain symbiosis with the overarching ideal environmental apparel design guideline. Multiple stages of design iteration, in the form of digitally illustrated technical flats and physical samples, led to development of the second garment prototype. The researcher utilized her tacit knowledge and design experience to develop the second garment prototype with process critiques of the concept provided by mentors and focus group participants.

Chapter 7 - Analysis of Objectives Five and Six

This chapter presents the findings and discussion of the fifth and sixth research objectives. The fifth research objective was to evaluate the application of the sustainable apparel design concept to the resulting apparel garment prototype to determine if it effectively reflected the target market's understanding of sustainable apparel and desired outcome. The sixth objective was to reflect on the utilization of participatory design methods within the apparel design process. The chapter concludes with a discussion positioning the two research objectives within the study as a whole. In order to substantiate the analysis and conclusions, the chapter makes use of illustrative quotations from the focus group sessions.

Collection of data regarding research objectives Five and Six occurred during the third focus group session. Participants 1, 2, 4, 5, 6, and 9 remained active through the duration of the research study, attending the third focus group session to evaluate the application of the design strategy and resulting apparel product, as well as, discuss the participatory design process. Due to the timeframe of the final focus group sessions (occurring just prior to final exams), three participants (3, 7, and 8) who had previously participated in each of the focus group sessions were unable to attend either of the final focus group meeting times. Division of the participants into two separate groups occurred due to participant availability. The first group included Participants 1, 2, 4, and 5 and the second group included Participants 6 and 9. Participant 4 had previously attended sessions one and two with Participants 6 and 9, however, due to her schedule, she requested to attend the alternative session. Therefore, because she encountered a new selection of participants during the final session it is possible that her participation in a new focus group influenced her own degree of participation as well as that of the other participants

during that session. Additionally, as evaluation occurred in the form of group discussion, not all participants responded to each question or gave indication of their opinion.

Research Objective Five: Evaluation of the Sustainable Apparel Design Concept

Application and the Resulting Apparel Product

In this thesis, the fifth research objective was to evaluate the application of the sustainable apparel design concept to the resulting apparel garment prototype to determine if it effectively reflected the target market's understanding of sustainable apparel and their desired outcome. In order to achieve the fifth research objective, the researcher met with focus group participants for a third focus group session allowing participants the opportunity to try on the garment prototype, transition the prototype, and then discuss through semi-structured conversation, the strengths and weaknesses of the sustainable apparel design concept and garment prototype. This research objective served to gauge the effectiveness of the chosen sustainable design concept towards the development of an apparel product.

Evaluation of the Environmentally Sustainable Apparel Design Concept

In order to evaluate the effectiveness of the chosen sustainable apparel design concept, participants interacted with the resulting apparel garment and then proceeded with a semi-structured discussion regarding their impressions of the garment and concept. At the onset of the meeting, the researcher requested a volunteer to model the garment. Following the initial participant model within each session, all remaining participants also chose to model the garment. During this interaction with the garment, participants began discussing the garment without prompting from the researcher. This open and natural discussion led into a series of pre-

determined questions guided by the researcher. Questions from the researcher aimed to gauge the success of the sustainable apparel design concept. Predetermined questions included:

- What do you think of the design concept?
- Do you think the design is sustainable?
- What would make it more sustainable?
- How else could this concept be used?

General discussion of the design concept. The group accepted the concept as a successful sustainable apparel design. Indication of acceptance was similar in each session; a participant suggested how the application of the environmentally sustainable design concept could potentially replace numerous other garments through seasonal changes. Further indicating acceptance of the design concept, participants rapidly embraced the prototype garment as a representational unit of a potential system of outerwear garments. For example, Participant 5 stated,

I think you know if we have the different types of shells, different colors, and different fabrics and even maybe like a raincoat. You could use the same system all year around... You can change your look without buying another jacket with all these other layers to deal with; you could just change the shell of the jacket. I feel like that would be nice especially transitioning from season to season...

Participants indicated confusion both vocally and physically regarding the transition of the garment as they interacted with it, but later suggested that consumers would overcome this initial confusion. Participant 6 explained,

I think in the beginning people will think it's hard , but then after doing it they would be like 'well, no I won't need but like one coat,' so I think they would see like that functionality of it and just be like well okay, it's worth it.

Participants' evaluation of the sustainability of the apparel design concept. When asked to consider the sustainability of the environmentally sustainable apparel design concept, participants responded with mixed reviews. The responses did not relate to all aspects of sustainability because participants answered candidly, rather than the researcher prompting them to consider particular stages and aspects of sustainability. Additionally, although many of the responses focused on the concept as it related to the specific application of outerwear, many of these responses are applicable to the concept as applied to any garment.

The main aspects of sustainability addressed by participants were apparel care and quantity of purchases. For example, Participant 9 responded to the researcher that she believed she would use less water and energy laundering the garment because she could wash only the soiled layer instead of an entire jacket, stating, "Now it's just layers to wash instead of the whole jacket or multiple jackets." Meanwhile, Participant 1 indicated that she would launder the garment layers more often than she currently launders her outerwear because the layers are more easily separated, explaining, "With my coat, I never wash it. But I think that with the different layers... I would wash it more and so – I would be washing it more than I would wash the one I have now."

On analysis of these two seemingly opposing responses, the researcher concludes that the responses are not directly comparable, and supports Participant 9's stance. While both responses relate laundering behavior to the garment's ease of separation between layers, the two participants suggest that this characteristic will influence vastly different results. Participant 9 will conserve water and energy by laundering smaller material loads, while Participant 1 will expend greater amounts of water and energy by laundering layers of the garment more frequently

than her current outerwear. Therefore, direct comparison of the responses is not possible, as Participant 9 refers to the amount of water and energy inputted for a single load and Participant 1 refers to a cumulative amount of water and energy inputted through more frequent laundering. However, due to the application of easily cared for materials (directed by the Target Market's Ideal Apparel Characteristics), it is possible to launder the garment layers alongside average clothing items within a load; as opposed to laundering large bulky outerwear garments individually requiring increased amounts of water and energy beyond the consumer's typical number of loads. For this reason, the researcher supported the stance of Participant 9 that the separation of layers will reduce the amount of water and energy expended during garment care.

Participants also offered mixed responses regarding the quantity of apparel purchases necessitated by the design concept. Participant 6 remarked multiple times that she felt the concept was successful because it reduced the need for numerous apparel items of the same type (in this case outerwear).

Let's say you walked to your office every day. In the morning it's obviously colder so then you could put the core in, and then if you're walking home, if it's hotter, take the core out and you have like a light jacket. So I really like it... I think it would be marketable to people that live in the city that can't have a lot of clothes because the closet space is limited. Now they have one jacket that can do it all.

Yet, Participant 2 suggested that in order to maintain consumers' interest and remain on trend, numerous shell styles would need to be available, thus detracting from the original concept of producing less waste.

I feel like if you have a lot of shells; it detracts from what you want in the first place. But I think if you only offer one or two types, people are kind of going to get bored with it. I mean, it's like their staple item; a few years down the line there is going to be something new. You know a new pattern is going to be in style or a new style completely. If that's what is trending, people are going to

want to buy it, so you got to do something that keeps trending and is a staple item that is kind of a go-to item on the daily basis.

Again, direct comparison of the two responses is not possible. However, compared analysis of the response topics and the participants' outlook (positive or negative), increases further understanding of their viewpoints as members of the target market.

In her comment, Participant 6 referred to the number of garments needed within a single day, for example she envisioned a collection of layered garments added or removed throughout the day to adjust for the consumer's environment. In comparison, the transitional outerwear garment presented an adaptive solution to environmental settings (such as temperature) that she considered more simplified and user-friendly.

Yet, Participant 2's deduction, regarding consumers' desire to remain on trend, was also an area of concept disagreement with which the researcher struggled during design development. From the findings related to Objective One the researcher concluded that consumers desire wardrobe variety and hedonic acquisition experiences, however, if their purchase behavior can be directed to a shell layer, rather than an entirely new garment comprised of all layers, then a more sustainable purchase decision would have occurred, even if the consumer repetitively purchases shells.

Increased sustainability of the design concept. As a follow-up question to participants' understanding of the current sustainable elements of the garment, the researcher asked the participants if they could think of any way to increase its sustainability. This line of questioning led to a response from only one participant. Participant 6 suggested that the core layer could potentially be created from previously used materials because it will not always be seen by

others; reducing the required amount of new textiles, while also reducing the amount of textile waste heading to the landfill.

Maybe for like the inside like slip piece, I guess. You could try to recycle like any kind of fabric because I mean, if you're not seeing it so much... And maybe that's like something you have put on the tag too, it's like this inside layer is made from recycled material and it's helping out the environment because I mean a lot of people are like the green thing so that's big a good seller too.

The researcher found no other responses relevant to the discussion of increasing the garment's sustainability. Possible reasons for the lack of comments or suggestions could be that the participants did not consider themselves knowledgeable enough about sustainability or about apparel design to provide additional input. Additionally the participants may have been unwilling to voice a suggestion within the focus group setting, which is a known limitation to the research method.

Evaluation of the Resulting Apparel Design

Evaluation regarding the participants' impressions of the garment occurred through the semi-structured discussion of the third focus group session. Participants openly discussed their opinions of the apparel garment while interacting with it, before proceeding to focusing on the predetermined questions guided by the researcher. Questions, aimed at gauging the success of the garment design, included:

- What do you think of the design?
- What do you like about the design?
- What don't you like about the design?
- How could it function better?

- How else could we improve the design?

Participants' impressions of the garment design. Participants who responded liked the garment design and felt the target market would accept the garment. Participant 5 stated,

I really like it. I think it's clever, especially with all of the reversible buttons and how you can kind of just change the feel of it. You could wear it a lot longer than just once... I just see it as something I could see a lot of people wearing.

The participants positively approved of aesthetic elements such as the extended collar of the bolero jacket shell and the removable dual button elastic fasteners. Participant 1 shared,

I really do like the idea of the interchangeable buttons, I think that's really cool because sometimes you want to be dressy, and sometimes a little bit more casual. So it's nice if you can switch. I like how quickly you can just take them out and flip them.

The vest core layer received mixed reviews as a stand-alone garment. Some participants who professed to wear regularly vests felt that the design was missing certain elements that they would prefer such as a collar and added length. Participant 2 expressed that she did not often wear vests, but appreciated the benefit of the additional layer, "I usually don't wear vests – I just look weird in them, but while wearing that, I definitely felt warmer." In the other focus group session, Participant 9 gave suggestions to improve the style of the vest, "I actually am a vest-wearer. But normally they have a collar, so that is something that I would like, and also, for me, personally, I would like it longer because I have a long torso."

Certain elements of the design did receive critiques and recommended modifications. For example, participants felt the bust point buttons, joining the shell layer and bolero jacket, were unnecessary and drew unwanted attention to the bust. Additionally, Participants 6 and 9 agreed that a kick-pleat would allow for easier movement. Participant 6 explained, "It constricts your

leg movement. If you made the base like a little looser... A lot of time these jackets have like a kick-pleat in the back and I think sometimes that helps again with movement while walking.”

Due to the study’s timeline, numerous design changes occurred between focus group sessions; yet, participants were not shown design iterations after the second focus group session. Perhaps, if the researcher had sent the participants updated images of the design developments between meetings prior to prototype development, some of the negative comments could have been avoided. Additionally, participants have more experience with physical or photographic representations of apparel garments than with digital illustrations, thus clarification and understanding of desired and undesired garment elements could potentially benefit from the discussion of photos of actual garments or existing apparel items prior to design refinement.

Further refinement at the prototype stage through the addition of another mentor evaluation would also have aided in the refinement of the garment design. Again, due to the study’s timeline, the mentors were only briefly in contact with the second prototype garment, just prior to its completion and evaluation by the focus group participants. Mentors noted necessary pattern adjustments to account for the additional layers and further refinement of construction.

Increased function of the garment design. During the final focus group, the researcher asked participants about the garment function and for suggestions of how to improve functionality. Responses tended to relate to the transition process and the transition mechanisms. For example, Participant 6 felt that a zipper attachment between the shell and core layer would be more effective than the button fasteners, stating, “Maybe do the zippers that will take the bulk off because you just do a zipper where the two fabrics come together, and then just zip it up... I feel like it wouldn’t fold as much because the whole thing would be zipped so it would give a

structure.” Participant 5 suggested magnets, “You could just pop it off like a layer, then insert that [the core], and then pop that [the exterior layer] back on. That way you’re not fumbling with layers.”

Participants further voiced concern over the intuitiveness of the transition, Participant 6 said, “I mean once we figured it out, I think we got it. At first I just kind of didn’t know what I was doing, and then just started moving the buttons, like oh that makes sense!” Participant 9 indicated that initially she didn’t feel the transition was instinctive, but once consumers understood how to make the transition they would feel that the benefits were worth it.

Participant 2 felt that the center front zipper on the core vest layer could be removed, and the vest could also utilize the removable dual button elastic fasteners as a closure, therefor giving purpose to the button holes when the vest is worn alone. Participant 2 stated, “I haven’t really seen any vest like that, with the buttons so I think it would just make it a little bit different.”

The greatest success in functionality of the transitional garment was the interchangeable dual button fasteners. In the application of the designed outerwear garment, participants all requested neutral color choices for the overall garment material yet they were pleased by the possibility of transitioning buttons from a traditional style to a more unique style. Small or inconspicuous transitional elements might lead consumers to desire fewer garments and rather focus their interest on small elements to display their personalities.

While the researcher considered functional elements of the design during design ideation and refinement stages, little application or hands on manipulation could occur prior to development of a physical prototype. These functional design elements are critical to progression of the concept as a successful sustainable apparel design, so additional refinement is necessary

prior to development of the next iteration. Increased intuitiveness of the transition is possible through the decrease in quantity of anchor points and the elimination of closure redundancies as mentioned by the participants.

Researcher Reflections on the Design Evaluation

As previously noted, throughout the design process, the researcher recorded reflections and observations on the design development and participatory design process. In this section, the researcher responds to her own reflections made during and following the third focus group session, including the design development through sketches and prototypes. Due to the multiple methods of recording reflections, the following bulleted list summarized the data.

- Through development of a full prototype (core and shell layers), the researcher was able to identify areas of further refinement which had previously not been evident. Including elements of the pattern drafting which were not aligning or fitting properly, and construction/finishing related to the bolero shell layer. However, due to the timeline the researcher was unable to correct these issues before the final focus group meeting, which occurred during the final week of the semester.
- Additionally, the researcher had planned and purchased materials for the development of a second shell layer. The second layer would not have reflected participant suggestions regarding the design and would have provided an opportunity to see their reactions to a design they had not influenced. In addition, the second shell would have further demonstrated the design concept's ability to transform for different environments and settings.

- The researcher struggled with some decisions regarding the patternmaking and construction; in hindsight, she would make further adjustments to the shell design allowing a seamless separation between the bolero and vest as individually wearable layers. Further, she would pursue mentor patternmaking input. Due to the tight schedule and not knowing when it would be appropriate to receive such assistance, the researcher was not comfortable pursuing help.
- Participants were able to offer aesthetic feedback regarding the garment prototype, and a few made very astute observations regarding the sustainability of the garment. Whereas, the mentors were able to observe issues related to the technical design and development of the garment.

The development of the garment prototype did not reach a final stage reflecting a perfected fit, transition, or shell design. Further, the lack of development of an alternative shell layer limited the participants' exposure and understanding of the design concept's possibilities. However, these are common struggles encountered during the design process because until a full and functioning prototype is developed, full refinement cannot occur. Likewise, without better representation of the shell and core layer relationship, through the presentation of multiple shell styles, the full concept is difficult to understand and refine.

Objective Five Summary

Overall, participants felt the sustainable apparel design concept and prototype garment design were successful. However, further refinement of the transition and transitional mechanisms of the apparel design concept are necessary. Additionally, improvements to the pattern draft and construction techniques will improve the aesthetic appearance of the garment. Other than the utilization of environmentally friendly materials, such as previously used textiles,

participants were unable to suggest additional ways to increase the concept's sustainability. Additionally, specific aesthetic elements of the garment design, including eliminating the bust point buttons and adding a kick-pleat were recorded for future consideration and product development. While the participants embraced the interchangeable dual button fasteners with enthusiasm, further design refinement is necessary to move the item from the prototype stage to a finished product.

Research Objective Six: Participatory Design Methods within the Apparel Design Process.

In this thesis, the sixth research objective was to reflect on the utilization of participatory design methods within the apparel design process. This research objective served to examine participatory design methods, in relation to the apparel design process, in order to further knowledge regarding design methods and processes within the apparel design discipline.

Presentation of the findings begins with an introduction to the research objective. Then is a presentation of the participants' assessment of the participatory design methods within the apparel design process, including what they enjoyed about the process, their level of participation, and perceived contributions. Next, the section presents participants' considerations on improvements to the participatory design process and their experience during the online portion of the study. Finally, the chapter concludes with a researcher's reflection on the participatory design process.

Observations on Participatory Design Methods within the Apparel Design Process

In order to achieve the sixth research objective, during the second half of the third focus group session, the researcher led a semi-structured discussion about the participatory design process. Participants were able to discuss their experiences as participants in the apparel design

process. The purpose of the questions was to gauge the participants' impression of participatory design methods within the apparel design process, including:

- What did you enjoy about participating in the design process?
- What didn't you enjoy about participating in the design process?
- Would you like to have been more/less involved in the design process?
- Did you feel like your input was beneficial to the design prototype?

At the end of the session, the researcher invited the participants to ask any remaining questions they might have regarding the research study or about their experience within the study.

Participants' observations regarding their experience. Participants reported that they enjoyed learning about the apparel industry, design process, and the sustainability aspects of apparel. Four participants of the final six vocalized that they had never considered the environmental impact of their clothing and that their participation in the study gave them a lot to think about when viewing their own closets or shopping for new apparel. Additionally participants shared that they enjoyed seeing their ideas become a physical product, explaining that at the beginning they were just talking without any real idea of how their ideas could become more than that. Participant 6 shared that she previously had no knowledge regarding apparel design and sustainability but that participation in the design of a physical product was a positive experience, "It was different because I didn't know anything about design and sustainability of clothing, so it kind of opened a whole new world... It's just kind of neat to see how we started out trying to figure out what we wanted to do, and we actually have something now. That was cool." Participant 9 agreed on both counts, "Yeah I never, thought about the eco-side of manufacturing clothes that just never occurred to me I guess. That was interesting to hear

about. It would be like ‘Oh that’s actually a big chunk of things to be aware of’...It was so rewarding to see that [the physical product of our ideas].” In the other focus group, Participant 5 also reflected on the positive experience that design participation offered, “It’s kind of nice to see how our ideas transformed into something material.”

None of the participants gave any indication that they did not enjoy participating in the study or that they had regrets regarding their participation. The lack of negative comments could be due to the researcher’s presence during the evaluation and participants’ respect for her feelings. Another possible reason for the lack of negative feedback regarding the participatory design process could be that, as other researchers have noted, Millennials enjoy involvement in the design process as well as combining efforts to work as a team (Bylenga, 2009). Participant 1 went so far as to elaborate on why she found the voluntary focus group to be an enjoyable experience,

I like the group, because I knew other people’s perspectives, especially dealing with clothes, other people’s opinions on that are so drastically different. You know, it’s really nice to meet new people and see how—because all of us have different lifestyles, it’s kind of nice to get that input. Whereas, I feel like the people you do know they just have similar lifestyles as you.

Level of involvement. The research also asked the participants if they would have preferred to be more or less involved in the design process. Participants indicated that they felt, given their level of experience, that they were as involved as much as possible. Participant 5 explained,

Overall, I feel like I was pretty involved. Not necessarily doing the sewing, thank goodness. I mean, I really like our contribution and looking at this, you know it feels like you really did listen to all of our ideas and put them together really nicely.

Participant 6 indicated, that given her level of experience and knowledge regarding sustainability and apparel design that she did not feel she could have been more involved, “only because I don’t know anything about design. I feel like I would have been lost. I think talking about it and what we already have; kind of thinking how we would modify – that’s like my max garment making capabilities.” However, Participant 1 suggested, and others (Participants 2, 4, and 5) agreed, that she would have liked to receive updates or images of the design as it progressed between the meeting sessions, “Our meeting times were so spaced out, could we get little updates or pictures to see how it’s going along?”

Beneficial contribution. The researcher also asked participants if they believed their participation was beneficial to the design outcome. All participants who verbally responded (n=4) to this question felt that their ideas were significantly influential to the outcome of the design concept and garment prototype. Participant 6 responded,

I like to think so... I think from like what we said that you really picked up on things. Like the hidden buttons in the seam, you [indicating another participant] said we should hide the buttons, so like you [indicating the researcher] picked up on it, but at the time, we were just like talking... I think it’s kind of interesting, because you have people who are in it [the design field], and you have outsiders like us, sometimes they [the outsiders] can generate the better ideas just because they’re not stuck.

No participants indicated that they felt they were not beneficial to the study’s outcome or that they felt that their ideas were not heard.

Improvements to the participatory design process. The researcher also asked participants if they felt that more could have been done to improve the participatory design process or to make it more fun and enjoyable. Very few participants (n=2) had any recommendations for improvements to their participation in the design process. Participant 1 stated that she felt updates and progress reports would be beneficial between meeting dates

(quoted above) and Participant 9 requested transcriptions or meeting minutes so that she could review the discussion. However, Participant 6 discussed participation in other studies and felt that this study was organized as well as it could be,

I think for being my first apparel participation study, it was good. You're not strict, and you're not like 'guys, you've got to stay on task and focused!' because sometimes when we get off into those conversations that's when we generate the best idea... I think the mixing of people, that it was as good as it could be. I think the mixing of the ages and the different demographics, it would have been too hard to be like, and 'okay we're all friends now!'... I think it was easy with the two of us [indicating Participant 9], because we are like on the same page most of the time. Whereas, sometimes someone else would be talking and it would be like 'I don't really get this'... And you get paid in this study.

Online Participation. Finally, the researcher asked the participants to reflect specifically on the online portion of the research study. The researcher noted that their remarks might be vague due to the length of time that had passed between the online portion and the final focus group. Participants who responded (4 out of 6 participants) enthusiastically indicated that they enjoyed the online ethnographic journal portion of the study. The utilization of Facebook made the process a simple task for them to engage in daily as they did recreational internet browsing. Participant 5 shared,

I enjoyed it. It seemed simple enough because we are always on Facebook anyways. There were a couple of days where I didn't think about it, and I missed taking a picture of what I was wearing. Then I would come back the next day and try to remember what I put on and take the picture. But for the most part, I think it worked out really well.

Meanwhile, Participant 2 agreed that it was simple, but also noted a change in her awareness,

I thought it was a simple enough task that I could just do it pretty fast. It wasn't really strenuous or whatever and it didn't take a lot of time away from my day or anything. Also, it made me think about some stuff, like realize, 'oh, I wear this all the time!'

However, one participant indicated that daily participation was necessary; otherwise, the task became more overwhelming as unanswered questions began to accumulate. Participant 6 explained,

It was easy, it's Facebook, so it's not like I had to memorize something else to login to everyday. I was just like, 'okay, I need to go and post', and I would just go do that. I felt like sometimes, I would go a day and not post, then log on the next day and there would be like [four or five] questions. But that's just kind of how things go, when you can't get to a computer so... At least you were lenient; you said 'try to answer everything by this point.' So, it's not like, 'well, you missed it one day so you're done!'

Participant 9 indicated that she understood the purpose of the online ethnographic journal, even though at times she struggled with how to answer,

Actually, I liked it. But, I struggled with it, like I didn't know what I should say, because honestly, I really do wear t-shirts every day ... I like that there was a way for you to get to know our personalities before we started meeting, which was nice.

Researcher Observations on the Participatory Design Methods

Throughout the design process, the researcher reflected on the development of the design, interactions with the participants, participant influences, and the participatory design methods. After review of the reflections recorded throughout the design process it can be summarized that the researcher found the participatory design process to be a challenge as she sought to balance the influence of the participants, mentors, and herself. Compiling and analyzing the varying perspectives of the participants became very difficult as the researcher worked between two groups on a single concept and prototype garment design. The lack of design experience, apparel construction knowledge, and understanding of apparel's environmental impact among the participants frequently left the researcher to steer the ideas towards more applicable and appropriate directions – reducing the degree of originality and creativity of the participant's ideas

as they were filtered through the lens of design experience. Allowing the participants a more hands on approach, including the opportunity to manipulate materials and ponder the product development away from the focus group context, would potentially garner more useful input from otherwise inexperienced volunteers. Often, focus groups used during product development provide participants with a physical sample to help simulate real interaction with the product. In this study participants were not given a physical sample to manipulate until the final focus group which then garnered increased suggestions regarding physical aspects of the garment, such as the transition mechanisms and closures.

Additional reflection occurred at the conclusion of the third focus group sessions, the researcher invited participants to ask any remaining questions regarding the research study or the design process. Two participants had questions for the researcher. These thoughtful queries allowed the researcher to reflect on her participation within the participatory design process after the completion of the prototype garment design.

Participant 5: Do you feel that we really helped you in what you were trying to accomplish?

Researcher: Yes, I think it was really interesting to meet with everybody. You know, there would be a few ideas that I had kind of tossed around before, but I hadn't thought about the best way to do it... So I would hear you guys mention something and I would be like, 'oh, that's a good idea for that.' Or, we would maybe start [discussion] somewhere that's kind of a common idea, already out there in the design world, but then with your different backgrounds you would say, 'well, when I wear it, this happens and it bothers me' or 'maybe we could do something more like this,' and it would be really helpful... It was a challenge, especially working with so many people, to say, 'okay, I need to come up with something that is going to be of interest to all these different personalities that are all within a similar age group, and they're all students at college, but that might be the only thing they have in common. So what can I do about that?' I came up with a lot of crazy ideas that never made it to that second meeting and even at this meeting we've come up with some new ideas, or different ways we could do it. So every single meeting, the more I talk with you, I think about different things that we could be doing.

Participant 2: Were there any ideas that you had, that you wished could have happened and didn't? Or did you come up with an initial idea of like, 'oh, I want to make this,' and that wasn't what we did?

Researcher: No, I didn't come in with any initial ideas whatsoever. I mean, I have information about what's happening out there, and what designers are trying to do. And I considered those, I literally called them 'known strategies' in my writing because these are things that other people are already considering and trying out. I knew that there was a possibility that whatever we did would fall into one of those situations that was very similar to that, and it kind of did, but it also didn't. There were new aspects of what we did that kind of built off of an existing strategy that's out there, which is kind of like a modular clothing design, but we did it a whole different way.

It was very difficult for me to go home and think about all the different ideas we had, and try to sort them out into something that could actually function and then how best to make it function like, 'okay, we want these interchangeable buttons. Well, how do I actually do that? And— is it really a good idea?' So it's a challenge to sort through it and come up with what was best applied to this idea and what made the most sense.

And there were times, when I came up with some different ideas, and I thought, 'that doesn't necessarily reflect what they were telling me.' I wanted my influence to be there, but I wanted your influence to be there more. So I don't think that I lost anything by not necessarily using my own ideas, but I think it challenged me to think about things differently.

Objective Six Summary

In order to fulfill research objective six, to reflect on the utilization of participatory design methods within the apparel design process, the researcher met with focus group participants for an evaluative session allowing participants the opportunity to provide feedback on the design process, and their experiences. The researcher also kept reflective records throughout the design process, additionally, at the conclusion of the design process, the researcher allowed participants the opportunity to interview her regarding her experience throughout the duration of the study.

In general, the participants responded positively to their involvement in the design process; specific elements that were positively recalled included learning about the apparel

industry, design process, and the sustainability aspects of apparel. Furthermore, participants reported their pleasure at seeing their ideas develop into a physical garment prototype. No participants specified that they did not enjoy their participation, or that they held any regrets concerning their participation. Participants indicated contentment regarding their level of involvement within the design process, though they suggested providing updates or images of the design as it progressed between the meeting sessions as a method to maintain/increase involvement without requiring additional participant time. All responding participants indicated that they felt their ideas were influential to the outcome of the design concept and garment prototype. No indication was given that participants felt they were not helpful to the outcome, or that they felt neglected during the design process. Participants enthusiastically responded that they enjoyed the online ethnographic journal portion of the study. Facebook made the process a simple daily task easily engaged in as they did recreational internet browsing; yet, one participant noted that daily participation was essential, or else the task became more overwhelming.

During the design process, the researcher reflected that she found the experience to be challenging to balance various influences. Compilation and analysis of the varying stakeholders became very difficult as the researcher worked between two groups of participants and her mentors. The lack of design experience, apparel construction knowledge, and understanding of apparel's environmental impact among the participants frequently left the researcher to rely on her own experience to guide the project, reducing the degree of originality and creativity that can reportedly be tapped through the utilization of participatory design. However, at the conclusion

of the design, the researcher felt more positively towards the experience as she eventually developed a product that seemed to represent the various influences.

Chapter 8 - Conclusion

Introduction

The previous three chapters reported the analysis of data for each of the study's research objectives. Chapter 8 consists of a summary of the research design and sample, research objectives, discussion of the findings, limitations, recommendations for further research, and conclusions.

Summary of the Research Design and Sample

The purpose of this study was to develop a new environmentally sustainable design concept using participatory design methods. The design research process was utilized as a framework within a practice-based design research methodology, while social design influenced the use of established qualitative research methods. The study also employed practice-based apparel design methods to both aid in the development of the sustainable apparel design concept, as well as document the ideation, refinement, and design execution stages.

The sample was a volunteer sample of female participants aged 18 to 23 years. Ten individuals initially participated in the study. All participants were full-time students at a Midwest university. Participants were required to use Facebook and be able to meet at least three times for focus group sessions over the course of five months. Conducted from a social design approach, this study implemented multiple methods to collect data from the target market sample, including an online ethnographic journal and three focus group sessions.

Within the online ethnographic journal, the researcher, over a period of 15 days, posted an identical series of 57 questions to each of the participants. The questions explored the

participants' apparel experience and psychological attitudes and knowledge. A second intention of the questions was to increase participant awareness of decisions and observations related to apparel.

The analysis of the ethnographic journal data informed preparation of the first focus group session and the creation of a list of participants' ideal apparel characteristics and ideal environmental apparel characteristics. Finally, the information was refined to form the overarching environmental apparel guideline.

Following the online ethnographic journal, the students participated in three focus group sessions over a period of five months. The first focus group served multiple purposes. First participants were able to "break the ice" and become familiar with the focus group setting, second the researcher was able to introduce the purpose of the research study and the roles the participants would serve, third the participants were able to begin brainstorming environmentally sustainable garment ideas. Following the first focus group, the session was transcribed, and the data was analyzed in comparison to the data collected from the online ethnographic journal. The researcher reduced the data to compile a list of participant suggested garment ideas, and a list of participant identified product adoption roadblocks. The researcher further applied the data collected through the online ethnographic journal and first focus group session to the development of an environmentally sustainable design concept. At this point, the research decided to apply the design concept to an outerwear garment and she created a digital concept sketch.

The second focus group session served as a method of design refinement. The researcher presented the concept statement and digital concept sketch to the participants. Participants were able to ask questions and make suggestions regarding both the concept statement and digital

concept sketch. The researcher edited the digital sketch using computer aided design software while participants directed changes to the sketch, informing design elements, style lines, color and length.

Following the second focus group session, transcription of the data occurred and the researcher further refined the digital sketch in response to participants' requests and suggestions. The sketch was then introduced to the researcher's mentors for further suggestions and refinement, after which development of the first full scale garment prototype began. A second mentor meeting further refined the apparel garment design influencing multiple changes to the prototype design. Additionally the researcher continued sourcing materials and inspiration, which also influenced the prototype design. A second full scale prototype was constructed, and another mentor meeting occurred for a short limited-exposure evaluation.

The third focus group session served as a method of design refinement through a hands-on evaluation of the second garment prototype. Participants were able to interact with the garment by, for example, trying the garment on, transitioning the garment, and viewing it on other participants. Throughout this interaction, participants openly discussed aspects of the garment design, which lead into a series of pre-determined questions facilitated by the researcher. Additionally participants were able to evaluate and reflect on their participation in the design process through a series of pre-determined questions from the researcher. Finally, participants asked any remaining questions of the researcher before conclusion of the focus group session. Following the third focus group session, data transcription and analysis occurred through a process of coding and theme construction.

Discussion of the Objectives and Findings

Next, is discussion of the six research objectives and related findings. Additionally, the design research process model, developed in the formative stages of the research and presented initially in Chapter 3, is revisited for modifications reflecting the actual research study.

Current Apparel Attitudes and Consumption Behaviors of the Sample

The first research objective was to identify the current apparel attitudes and consumption behaviors of young adults who are potential sustainable apparel consumers through participatory focus groups and qualitative data collection methods. Chapter 5 initially reported the results and analysis of this objective. This objective was comprised of three broad interest areas: consumers' attitudes towards apparel and its significance, consumers' acquisition behaviors and preferences, and consumer's apparel storage, care, repair and disposal behaviors.

Consumers' attitudes towards apparel and its significance. The first area of interest related to Objective One was consumers' attitudes towards apparel and its significance within their lives. The study found a perception among the participants that apparel could provide physical and emotional comfort. This finding relates to a second attitude expressed by the participants that judgment of others based on appearance and dress is human nature. These findings were influential during the design process as the researcher considered the user's functional, aesthetic and emotional needs. The researcher concluded that apparel design in this study should provide a sense of comfort within a social setting through material selection and aesthetic elements of conformity, while also allowing for individual expression through transitional or user-designed aesthetic elements. This finding compliments the considerations relating to "Demands of the culture" and "Aesthetic decisions" discussed by McCann et al.

(2005) in development of their “Critical Path” model in application to smart clothing. Further, this conclusion considers elements of functional and aesthetic needs, while also providing for the wearer’s emotional needs for psychological security and expression reflecting elements of the FAE consumer needs model (Lamb & Kallal, 1992).

Consumers’ apparel acquisition behaviors and preferences. The second area of investigation related to research objective one was participants’ apparel acquisition behaviors and preferences. Overall, participants tend to be motivated to shop for a variety of both hedonic and utilitarian experiences, supporting findings by Babin et al. (1994) and Westbrook and Black (1995). However, in a recent study by Moore and Carpenter (2008), the Millennial generation was found to shop more for enjoyment, than other elder generations. The primary implication of this finding was that, when considering the appeal of the developed garment to the participants, the researcher considered both hedonic and utilitarian motivations.

Participants also addressed the factors that most highly influenced their purchase decisions as being first impression (style, color, and wardrobe versatility), fit, and price. Thus from the researcher’s perspective, these factors were considered important to the development of the final apparel product. This finding supports research by Eckman et al. (1990) reflecting elements of the “Interest” and “Trial” stages presented within their “Model of the Apparel Purchase Process”. Eckman et al. reported four major criterion: aesthetic, usefulness, performance and quality; the aesthetic set was found to have the greatest impact prior to entering the “Trial” stage and comprised elements of style, color and pattern, fabric, and appearance. Fit was found to impact purchase decision during the “Trial” stage of the apparel purchase process; however, Eckman et al. reported that price was not highly considered by the participants in their

study. They suggested this might be due to the selection of stores within the consumer's price range, whereas in this study price was a major factor mentioned by participants. It is possible that members of the Millennial generation are not selecting stores as explicitly in regards to their financial situation as previous generations, or perhaps due to the participants ages and employment status, price is more highly considered than it is for other consumers. Further, in this study the participants were all students with educational expenses, rather than individuals with financial support in the form of a full-time job or spouse.

On the basis of the findings, the researcher determined that the apparel product developed in this study needed to be: aesthetically pleasing in style and color, flexible within the consumers wardrobe, fit well through appropriate design elements and construction techniques, and finally remain within the target market's price range. Additionally, participants indicated that variety and versatility were highly important to their purchase decisions, opting for many items at low prices rather than a few higher priced garments. This finding supports the concept of transitional items that can provide greater variety and versatility within a user's wardrobe.

Consumers' apparel storage, care, repair, and disposal behaviors. The third area of interest related to research objective one was apparel storage, care, repair, and disposal behaviors. Each participant noted a lack of adequate apparel storage. Ha-Brookshire and Hodges found a similar response during their research regarding used clothing donation behavior (2009). This finding revealed an area for improvement and inspired the design of a modular garment able to be stored more simply or within limited storage spaces. Participants' responses to apparel care questions revealed that apparel care is a learned behavior. Some participants indicated a feckless attitude towards apparel care and storage. These findings influenced design ideation and

refinement. Thus, the design garment provided simplified care methods in the form of separating layers, constructed from easily laundered materials. The design concept as applied to outerwear garments, reduced the consumer care process by eliminating trips to the drycleaner or additional loads of larger bulky items, and potentially lengthened the lifecycle of an apparel garment by allowing care to be layer specific. Additionally, participants' responses divided regarding apparel repair and alteration. It is possible that the youth of this market limits the accessibility of repair/care or alteration services due to financial burden. Thus, the researcher concluded that designs providing simple alteration improving fit or style without actual construction knowledge are ideal for this target market and applied this conclusion to the design concept. Participants also gave split responses regarding the concept of apparel re-design; this indicated that garments designed for user interaction should be highly intuitive without additional apparel construction or sewing knowledge necessary. Very little scholarly research exists regarding consumer apparel care and repair. Particularly interesting would be a generational comparison of these behaviors and attitudes as it could help predict future trends regarding these topics.

Finally, participants' disposal behaviors indicated that the target market is likely to maintain a garment within their wardrobe for a lengthened life cycle as long as the garment still functions both aesthetically and physically, this conclusion influenced the researcher's decision to seek out modular design methods allowing users the option to dispose of the damaged apparel component only. Additionally, the consumers are likely to pursue other options of disposal such as donation, handing down, or repurposing prior to garbage disposal, supporting research by Morgan and Birtwistle (2009). This could indicate a willingness to return a used item to the store for recycling/repurposing in exchange for a discount or credit. This behavior would employ

another sustainable design strategy, Product Service Systems, providing the consumer with an environmental and economic option for disposal.

Current Environmental Attitudes and Preferences of the Sample

The second research objective was to identify the current environmental attitudes and preferences of young adults who are potential sustainable apparel consumers. Chapter 5 initially reported the analysis of this objective. The second research objective was comprised of two broad interest areas including participants' eco-conscious knowledge and practices and participants' knowledge of the apparel industry and apparel sustainability.

Participants' eco-conscious knowledge and practices. The first interest area, related to research objective two, was participants' eco-conscious knowledge and practices. Participants' responses indicated relatively little understanding of the effect of human behaviors on the environment, particularly consumer behaviors, supporting previous research in this area (Hiller Connell & Kozar, 2011; Morgan & Birtwistle, 2009). Moreover, participants believed environmentally preferable/organic products cost more, which may prevent the participants from even engaging in shopping for environmentally preferable products. These findings are interesting as the Millennial generation is said to highly value such things as "making a difference," "environmental stewardship," and "global perspective" (Brand Amplitude, 2009). While the apparel garment prototype did not represent these findings, they were influential to plans for future research regarding concepts of consumer education extended through apparel marketing and merchandising.

Participants' knowledge of the apparel industry and apparel sustainability. The second area of interest related to research objective two was participants' knowledge of the apparel industry and apparel sustainability. Participants expressed an interest and eagerness to

understand environmentally sustainable apparel consumption. Yet, their current reported efforts to gain knowledge and participate as eco-conscious apparel consumers were minimal. This finding supports previous research indicating discordance between the market's interests or attitudes and actual behavior (Hiller Connell, 2010). Brand Amplitude (2009) reported that though the Millennials are highly interested in environmental stewardship and making a change, they are not currently the largest market for environmentally sustainable products.

The participants had very limited knowledge of the apparel industry and some even mentioned that they had never considered the procedures or scale of clothing production. This corresponds with previous research on the topic (Hill & Lee, 2012; Hiller Connell & Kozar, 2011). Additionally, it was apparent that the participants did not consider their apparel consumption to be a major environmental impact. However, they did indicate an interest in gaining more knowledge regarding various environmental impacts of apparel production.

The participant responses related to environmental sustainability and the apparel industry collected through the online ethnographic journal influenced the researcher's preparation of focus group meetings. Educational elements were included during both focus group one and two to help participants understand environmental sustainability as it relates to the apparel industry and apparel consumption. Additionally, these findings again suggest further research in the area of consumer education.

Generation of Sustainable Apparel Design Strategies

The third research objective was to generate sustainable apparel design strategies. Chapter 6 reported analysis of this objective. Utilizing the participants' ideas and the researcher's

tacit knowledge, the researcher developed an environmentally sustainable apparel design concept.

Garments designed to be versatile through various temperatures, social settings, and environments. Garments designed for temporary transition of functional and aesthetic elements including hem length, neckline, and sleeves possible through the use of hidden mechanisms. Further transitional ability should allow the garments to be layered for greater thermal insulation without detracting from the appearance of the garments.

This environmentally sustainable apparel design concept was representative of a pre-existing sustainable apparel design strategy, Design for User Interaction.

As mentioned during discussion in Chapter 6, this study did not fully achieve research objective three, the generation of sustainable apparel design strategies. This is likely due to the limited knowledge and experience of both the participants and the researcher. Having never conducted participatory research prior to this study, the researcher reflected on areas of uncertainty throughout the design process regarding the balance of influences, and preparation for focus group activities. Further education, preparation, and the opportunity to practice participatory design methods would improve the researcher's ability to guide the participants to meet the desired goals.

The participants were unable to express strategy ideas that were applicable to a spectrum of garments, likely due to their knowledge and experience of the apparel design process. Instead, participants primarily expressed sustainable apparel design ideas related to individual or experimental garments. This does not indicate, however, that there is not room for further strategy development; rather the researcher believes that the inclusion of participants with limited pre-existing apparel design and environmental sustainability knowledge decreased the potential for strategy development. If the participants had prior knowledge and experience with

environmentally sustainable apparel, it is possible that more advanced suggestions, applicable to strategy development, would have occurred. Furthermore, it is likely that the participants focused on the concept of transformable garments after viewing the example video presented by the researcher during the first focus group. However, this indicates that the participants perceived room for further exploration in the utilization of transformable apparel design, supporting the relevance of the existing strategy, Design for User Interaction.

Design and Develop an Environmentally Sustainable Apparel Product

The fourth objective was to design and develop an environmentally sustainable apparel product by applying the participant generated and researcher refined environmentally sustainable apparel design concept. Chapter 6 also reported the analysis and findings of this objective.

The progression of the sustainable design concept to a garment prototype allowed for application of the existing strategy, Design for User Interaction. The resulting prototype garment was a durable vest core layer with aesthetic enveloping shell, joined by button and buttonhole alignment points.

Overall, participants felt the sustainable apparel design concept and prototype garment design were successful. However, they asserted that further refinement of the transition of the apparel design concept was necessary. Additionally, improvements to the pattern draft and construction techniques would improve the aesthetic appearance of the garment. Other than the utilization of environmentally friendly materials, such as previously used textiles, participants were unable to suggest additional ways to increase the sustainability of the concept.

Additionally, the participants suggested changes to specific aesthetic elements of the garment design, including eliminating the bust point buttons and adding a kick-pleat. While the

participants embraced the interchangeable dual button fasteners with enthusiasm, further design refinement is needed to move the item from the prototype stage to a finished product.

Though the garment did not reach completion during the timeline of the research study, the design and development of the prototype reached a level that could quickly progress into a completed garment. The next steps to achieve the completed garment would be to implement the mentor and participant evaluations described in the next section of discussion, as well as utilize environmentally preferable materials.

Ideally, fabrication materials would include those that are not easily soiled and those that launder without excessive energy or water. While, recycled plastic polyester tech fleece is a viable option, other potential materials for the core layer are fine felted wool or a heavy organic cotton material. Each of these materials would fare well with cold or warm water and a low heat or air-dry cycle. A potential material for the trench coat shell would be organic cotton twill. Additionally a range of traditional trench coat colors could be achieved by using natural dyes such as walnut, sumac, or osage orange. Additionally, fabrication should attempt to allow for easy separation of technical and biological nutrients, thus necessitating the use of cotton/silk threads for construction of all natural fibers (wool, cotton, silk, etc.) and a 100% polyester thread for use with the polyester tech fleece. Coconut shell buttons are extremely sustainable as they are a bi-product of the food industry and do not harm the plant to harvest, thus they would be a wise choice for use with biological nutrient layers. Additionally, as mentioned by Participant 6, repurposed textile materials are worth exploring for development of the core layer, though this could make separation of materials more difficult.

Evaluate the Application of the Sustainable Apparel Design Concept

The fifth objective was to evaluate the application of the sustainable apparel design concept to the resulting apparel garment product to determine if it effectively reflected the target markets' understanding of sustainable apparel and desired outcome. Chapter 7 reported the results and analysis of this objective.

As a reflection of the Design for User Interaction strategy, the concept both succeeds and fails. The concept provides ample opportunity for consumers to interact with and enhance their garment (if considered as a system of interchangeable garment pieces), which would likely lead to a greater appreciation of the garment, perhaps lengthening its overall life cycle. However, it also, allows for further consumption behavior as consumers purchase additional elements to interchange. Further research, analyzing consumers' response to a full line of interchangeable elements could reveal more information regarding the sustainability of the concept.

The apparel design concept application is an elementary realization in this study. Without further development, utilizing appropriate materials and creating various shell options it is not possible to gauge the true capacity of the concept. The constructed garment does meet some of the conceptual elements; however, others remained unmet. Through the addition or subtraction of layers, the garment is transitional and therefore versatile through various temperatures. However, without construction of additional shell layers it is difficult to suggest that the garment met the desired requirement of versatility through various social settings and environments. Future shell development would experiment with diverse materials and styles to enhance the versatility of the garments. Additionally, greater versatility of the functional and aesthetic elements may be achievable through additional interchangeable shell layers; though, the constructed trench coat shell did provide a complete appearance transition from the tech vest

core layer. The final element of the design concept was to provide for thermal layering that did not detract aesthetically from the garment. Additional prototypes would be required to achieve the desired thermal layering capabilities without decreased aesthetic appeal. The second prototype, did not achieve this element of the concept. Further pattern refinement is necessary to meet this goal.

Ideally, a third prototype would help resolve the above stated issues, leading to greater acceptance. However, it is interesting to note that the participants did not focus on prototype issues. Rather, participants voiced excitement about the designed product, the fruition of their participation in the design process. Certainly, the participants were less observant of construction and patternmaking issues, as they do not have background in technical apparel development. Nevertheless, their enthusiasm towards the prototype indicates that participatory design, or other methods of social design, is likely to be accepted among the target market and may lead to the empathetic meaningful product relationship known to lengthen a garment's usable life cycle.

Reflect on the Utilization of Participatory Design Methods

The sixth objective was to reflect on the utilization of participatory design methods within apparel design. Chapter 7 reported the results and analysis of this objective.

In general, the participants responded positively to their involvement in the design process. Specific elements that the participants positively recalled included learning about the apparel industry, design process, and the sustainability aspects of apparel. Furthermore, participants reported their pleasure at seeing their ideas develop into a physical garment prototype. No participants specified that they did not enjoy their participation or that they held any regrets concerning their participation. Participants indicated being content with their level of involvement throughout the design process, although participants did suggest updates or images

of the design as it progressed between the meeting sessions as a method to maintain/increase involvement without requiring additional participant time. All responding participants indicated that they felt their ideas were influential to the outcome of the design concept and garment prototype. No indication was given that participants felt they were not helpful to the outcome or that they felt neglected during the design process. Participants enthusiastically responded that they enjoyed the online ethnographic journal portion of the study. Facebook made the process a simple daily task easily engaged in as they did recreational Internet browsing; yet, one participant noted that daily participation was essential, or else the task became overwhelming.

During the design process, the researcher found the experience to be challenging in terms of balancing various influences. While bias and influence are constant factors within qualitative research, it seemed that participatory design increased the degree of influence on the part of the researcher. The lack of design experience, apparel construction knowledge, and understanding of apparel's environmental impact among the participants frequently left the researcher to rely on her own experience to guide the project, reducing the degree of originality and creativity that is possible within participatory design. Additionally, compilation and analysis of the varying stakeholders became very difficult as the researcher worked between two groups of participants and her mentors. This challenge was also noted during research conducted by Lahtia and Seitamaa-Hakkarainenb (2005). However, at the conclusion of the design, the researcher felt more positively towards the experience as she eventually developed a product that seemed to represent the various influences.

Participatory design, as employed in this study, as a method of qualitative and inductive data collection requires rapid progression through analysis in order to inform the next stage of the research study. Additional experience in this area would increase the researcher's ability to

prepare questions and activities that explore unanticipated outcomes in greater depth. After analysis of all of the data, additional relevant questions became apparent which will serve in future research, but could have garnered more holistic data if included in the current study.

Revised Design Research Process Model

The researcher modified the initial design research process model (see Chapter 3), to reflect the actual procedures that occurred (see Figure 15). Hence, the discussion that follows outlines the actual stages of this study's design process.

In this study, the design process occurred in stages employing various methods of data collection and analysis; thus, the design research process model reflects these stages in each of the colored columns. The first stage was the Contextual Review, which informed the research proposal prior to committee approval. The second stage of research was Collection of User Data, and this occurred in the form of data collection and analysis of the online ethnographic journal. The third stage of research was Identification of the Problem, which occurred during the first focus group session as the researcher presented the contextual review to the target market sample in the form of a summative presentation. Also occurring during the first focus group session, was the fourth stage of the research study, Ideation, during which participants and the researcher brainstormed potential sustainable apparel design ideas, which were analyzed and further developed into a conceptual design and sketch concept. The next stage of the design process, and the last stage reached during this research study, was the Refine stage, focus group sessions two and three served as opportunities for refinement in this study. Progression of the design to the execute stage did not occur within the timeframe of the research study, and therefore is not reflected in this process model. In fact, another round of design refinement would occur in the form of an additional prototype, with further evaluatory critique sessions prior to the onset of the

Execute stage. Noted throughout the study are the influence of research parameters and reflection, illustrated as gray bars at the top and bottom of the figure.

Partial illustration of the design research process is possible, yet in reality, the process is far too complex for a two dimensional model to serve as a complete guide. The design process engages both the subconscious development and the physical creation of artifacts. In order to reconcile the subconscious with the physical progression of a designed artifact, consistent explanation of tacit knowledge and decision-making is necessary. Additionally, in a participatory design process, a great degree of effort is inputted individually by the researcher outside of sessions with participants and mentors making the reconciliation of the design's progression both difficult to explain or form into objective goals, as is necessary for valid and reliable research.

The design process has posed similar challenges to many seeking to thoroughly record practice and development (Parsons & Campbell, 2004; Rust & Wilson, 2001). As noted by Parsons and Campbell (2004), the progression of the design process includes movement between stages, but not always in a linear fashion. In this study, ideation and refinement occurred during both the sketch and prototype phases; even as the design developed, repetition of prior stages of the design process was necessary. Documentation of such progression was made through multiple sketch iterations and prototypes, yet not all design decisions can be recorded in this way, as noted by Rust and Wilson (2001). However, the inclusion of such evidence is indicative of the process.

Additionally, the researcher attempted to record her thoughts with audio memos recorded following interaction with participants and mentors or independent design sessions. However, the effort to then translate and document these musings in a transparent manner alongside the design development became overwhelming. The language of design does not explicitly translate

to the academic language in which research is typically reported. Flexibility in the discussion of creative and scholarly design would help progress the transparency of the field. Limiting the manners and methods within which design is reported to that of traditional research decreases the information that is shared. Perhaps a new language and method of presentation is needed to further the design discipline.

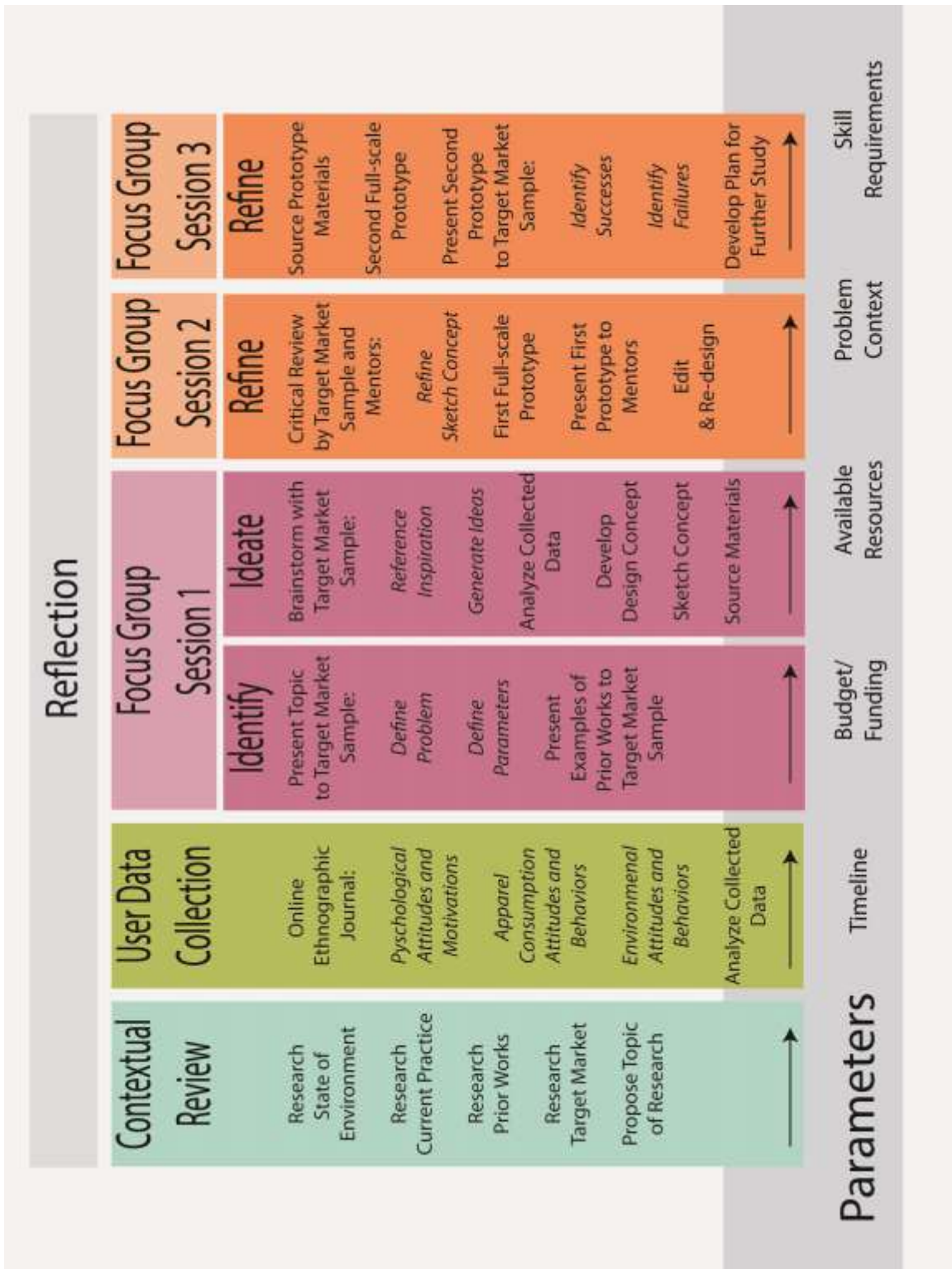


Figure 15. Revised design research process model indicating the actual stages of the research study.

Significance of the Study and Future Research

This study sought to include consumers in the apparel design process in order to develop environmentally sustainable design that engages the consumer in a meaningful and lasting product relationship through reflection of the consumer's ideal apparel characteristics, and unfulfilled apparel needs. In this section, the author combines discussion of the studies significance with suggestions of future research.

First, the information uncovered in this study regarding potential SACs within the Millennial generation is useful as a resource for those who target this generation, as it offers a broad surface level understanding of various aspects of consumer consumption attitudes and behaviors. The inductive style of this research study collected broad data at only surface depth regarding the Millennial generation that could be further analyzed and inspire more in depth research. One apparent issue and area for future research is the lack of knowledge regarding the apparel industry and environmental sustainability. Participants in this study had little to no knowledge regarding the apparel they wear, improving consumer education regarding the apparel industry and its environmental impacts are imperative for real change. It is perhaps, not a lack of caring, rather a lack of knowledge that limits consumer interest in environmentally sustainable apparel. Consumer assumptions based on media or second hand knowledge, though not always accurate, influence their attitudes and resulting behaviors. The provision of consumer education would likely improve the market and consumption of environmentally sustainable apparel. The use of participatory design also allowed opportunities for participant education; as noted previously participants indicated that they were interested in learning more about the apparel and textile industry, as well as more about sustainable apparel consumption behaviors. The

researcher implemented only basic educational efforts during this study at the onset of both focus group session one and focus group session two, however increased educational efforts could be made to help participants arrive at more sustainable design suggestions.

Additionally, the product outcomes could potentially lead to advanced apparel design concepts and strategies necessary for the reduction of the environmental impact of the apparel and textile industry. Future research should determine the best laundering methods to prevent structural changes affecting layer alignment for a multi-layer garment. Additional, future research should include the application of the sustainable apparel design concept to other garments including uniforms worn daily by school children, public service employees, and uniformed laborers. Future research should investigate the acceptance and adoption of co-designed garments within a wider market beyond the participants of the study.

Moreover, this research provided an opportunity for the application of participatory design methods that creative apparel designers employ less frequently than designers within other disciplines. The study indicates that consumers are interested in the design of their apparel and can become invested in the idea of an environmentally sustainable design objective. The participants were willing to share their experiences and attitudes in order to inform the direction of the designed concept and garment. Designers and educators of apparel design should employ elements of participatory design in combination with common apparel design methods. The challenges inherently incorporated in participatory design will lead to better preparation for employment when designers often target their work to a specific market or user. Perhaps development of a teaching platform combining participatory design with sustainable design would advance students capabilities and application of knowledge regarding both areas. Such a

platform could allow students the opportunity to educate consumers on sustainability while challenging them to incorporate external stakeholders' influence into design development.

Previous research, from numerous areas of design, influenced the methods used in this study. However, the researcher had to develop research instruments (i.e. the online ethnographic journal) and methods (i.e. the use of Facebook to create individual interactive journals, and the digital editing of the design sketch in-time with participants' suggestions and critique) of her own to meet the studies objectives within constraints of time, financing, available equipment and materials. In-depth explanation of these methods has been provided within this text in the hope that, designers and educators alike, will have access to necessary information and techniques. Thus, future research should further refine the processes initiated in this study to improve the data collection techniques employed in the participatory design of apparel.

Limitations

The researcher has identified four areas of research limitations applicable to this research study. The first area of limitations involves the study's sample, the second area of limitations arise from the research methods, the third area of limitations are related to the scale of the research study, and the final area of limitations relate to the topic of interest, the design discipline.

The sample of the study was comprised entirely of females from a single Midwest university, thus it is not representative or generalizable to the entire population of adults within the Millennial generation. As previously mentioned, the researcher worked with ten participants total, yet the sample had been reduced to only nine participants by the first focus group, another participant was unable to attend the second focus group session reducing the sample to eight

participants, and the final focus group session included only six participants. Thus, the sample size became quite limited as the study progressed. With such a small sample size (n=10), it is important to consider this study as a preliminary work revealing areas of future research, yet again unable to be generalized as a reliable source of data.

The second area of limitations arises from the participatory design research methods employed for data collection. The first method of data collection, the online ethnographic journal, allowed participants to respond to daily questions at their own rate and comfort level. While this method resulted in a large collection of rich data, it also allowed participants to pass any questions they were unable or uninterested in answering without any indication as to why they chose not to respond. Equally unavoidable was the variety of responses received, some participants appear to have carefully considered the question before posting a response while others seem to have quickly written a response with little consideration; resulting in a variety of answers with varying degrees of effort and content. The second method of data collection, the three focus group sessions, also allowed for varying response levels. Due to the discussion format, participants were able to determine their own level of involvement, often resulting in an excess of data from a few participants and a scarcity of data from others. Additionally, the researcher might have influenced the data interpretation unconsciously; minimization of this effect occurred through presentation of participants' direct quotes and phrasing allowing the reader to make his/her own deductions. Thus, regardless of the total sample size, some questions might have only received a few direct responses making the finding difficult to interpret or generalize even among the full sample.

The third area of limitations relate to the scale of the study. Due to the timeline of the research study, the garment development never reached its full potential and at least one more

prototype is recommended to refine issues of fit, construction, and aesthetics before the final garment could be attempted in environmentally preferable materials.

Finally, design is a subjective field; through the application of the concept to the development of an apparel garment prototype the researcher risked aesthetic disapproval, as well as disapproval due to sizing and fit issues from participants and mentors. The attempt to apply objective goals to a subjective field is admirable, yet design is a fluid process carving the terrain as it progresses and on occasion moving in unexpected directions or returning to earlier points of progress. The attempt made to document and record this process was challenging at best as it combines subconscious thought with physical processes requiring the reconciliation of both internal and external views of the study's progression.

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Appendix A. Sample Recruitment and Online Digital Ethnographic Journal

Included in this appendix are the research instruments:

- Recruitment Announcement
- Participant Consent Form
- Participant Questionnaire - Section A. Demographic Information
- Participant Questionnaire – Section B. Digital Ethnographic Journal

K-State Today Announcement

Your name: Erin Monfort-Nelson **Email:** emonfort@ksu.edu **Phone:** (xxx)-xxx-1186

Audience: current students **Category:** Volunteer Opportunity

Headline: Participants Needed for Apparel Design Research

Summary: Researchers in apparel and textiles invite K-State female students (ages 18-25) to take part in an exciting apparel design opportunity through a series of focus groups and online social media interaction. Compensation will be provided for your time.

Full Announcement Text:

Researchers in apparel and textiles invite K-State female students to take part in an exciting apparel design opportunity through a series of focus groups and online social media interaction. Participants will actively participate in the design process by sharing their own experiences, thoughts, and preferences regarding clothing. Additionally, participants will inform important design decisions regarding style, materials, and construction. Participants will have the opportunity to observe and evaluate the newly developed apparel item.

The study is ten weeks in duration. It will begin in mid-November with two weeks of online social media interaction and necessary participation throughout Thanksgiving break. The remaining eight weeks will include a total of three focus-group meetings, each lasting no longer than three hours.

While the study is entirely voluntary, compensation will be provided for each research activity, totaling up to \$40 with the chance to receive a bonus prize valued at \$70. To be eligible to participate in the research study, you must be:

- Female
- Between the ages of 18 and 25 years old
- Enrolled at Kansas State University (Fall 2012 and Spring 2013)
- A member of Facebook.com

No prior experience or knowledge of apparel design is necessary.

If you are interested, please contact Erin Monfort-Nelson at emonfort@ksu.edu. This study has been approved by the Institutional Review Board at Kansas State University. IRB Approval No. 6369

Requested Publish Date: 10/23/2012 and 10/29/2012

Comments for the Editor:

Dear Participants,

We are conducting a research study of apparel consumers with a focus on environmental design strategies. Your participation is completely voluntary. During this study you may choose to stop participating at any time. Your responses will be kept confidential; only the researcher will have access to identifying information. Data will be combined and analyzed as a whole unit. Your individual responses will be totally unidentifiable in this combined format. There are no known risks associated with this project which are greater than those encountered in daily life.

If you have any questions, please contact Erin Monfort-Nelson (xxx-xxx-1186, emonfort@k-state.edu). If you have any questions regarding your rights as a participant, you may contact Rick Scheidt the Institutional Review Board (IRB) Chair at Kansas State University at (785-532-1483, rscheidt@k-state.edu).

Erin Monfort-Nelson, M.S. Student, Sherry Haar, Ph.D. Associate Professor,

Kim Hiller-Connell, Ph.D. Associate Professor, Melody LeHew, Ph.D. Professor

Kansas State Univ. Dept. Apparel, Textiles & Interior Design

TERMS OF PARTICIPATION: I understand this project is research, and that my participation is completely voluntary. I also understand that if I decide to participate in this study, I may withdraw my consent at any time and stop participating at any time without explanation, penalty, or academic standing to which I may otherwise be entitled.

I verify that my signature below indicates that I have read and understand this consent form, and willingly agree to participate in this study under the terms described, and that my signature acknowledges that I have received a signed and dated copy of this consent form.

Participant Name: _____

Participant Signature: _____ Date: _____

Witness to Signature: _____ Date: _____

A. This section will collect personal information for demographic data analysis.

Your identity will be kept confidential, only the researcher will be privy to your personal information.

1. What is your name? _____

- a. May we contact you by phone or email? *Please give a current email address and phone number, then circle preferred method of contact.*

Email: _____ Phone Number: _____

2. Do you use Facebook.com? Yes _____ No _____

- a. If no, you are not eligible to participate in this study, thank you for your participation.

3. What is your age? _____

4. Are you a student at Kansas State University? Yes No

- a. Please indicate whether you are enrolled full or part time status: _____

- b. If yes, what year are you? *Please circle one.*

Freshman Sophomore Junior Senior 5th Year Masters Ph. D

- c. If no, you are not eligible to participate in this study, thank you for your participation.

5. Will you be attending Kansas State University during the Fall 2012 and Spring 2013 school year?

Yes _____ No _____

6. Do you have any children? Yes _____ No _____

- a. If yes, how many children do you have? _____

- b. If yes, what are their ages? _____

7. What is your employment status *Please circle one.*

Full-time Part-time Unemployed

8. Estimate your average monthly income? _____

9. How much on average do you spend on clothing per month? _____

10. Do you consider yourself to be eco-conscious? Yes No

Data Collection Package

Note to Participants: Throughout this study, online social media networks will be used to collect personal information. Each participant will share a “group” page only with the researcher; no other members will be added to the personal data collection pages. The researcher agrees to only view the information posted within the established page, not any information shared elsewhere on Facebook.com. At no time will you be asked to share inappropriate information or photos, you will not be asked to share any personal information that may put yourself or anyone else at risk in any way. Every effort will be made to safeguard your personal information, but please be aware that any data posted online is susceptible to unanticipated hacks. The person and university conducting this research are in no way responsible for any unanticipated information leaks that may occur by your own error or by the fault of any outside party.

How to Access Your Personal Web Page

1. Log into your personal account on Facebook.com.
2. Search for “Eco-design K-State”.
3. Add “Eco-design K-State” as a friend.
4. When offered, choose to “Join” the group “Data Collection”.

How to Respond to Questions on Your Personal Web Page

1. Log into your personal account on Facebook.com.
2. Open the group page, “Data Collection”, by clicking on the title in the left side bar of your browser window.
3. Read the question on the group wall completely. Follow any special instructions for that post.
 - a. If the question is open-ended it will be posted on the wall and you will be able to “Comment” directly on the question.
 - b. If the question has multiple choices it will be displayed as a poll on the wall and you will be able to select and submit your answer, or enter another option within the poll.

Try to respond to all questions within 24 hours of the post time.

4. At times you will be asked to clarify or further explain your response, please do so as soon as possible.

How to Upload Photos to Your Personal Web Page

1. Log into your personal account on Facebook.com.
2. Open the group page, “Data Collection”, by clicking on the title in the left side bar of your browser window.
3. Select “Add Photo/Video”.
 - a. *If you plan to add multiple photos select “Create Photo Album”, if you plan to add only a single photo at a time select “Upload Photo/Video”.*
4. Select the “Browse” button to find the photo(s) on your local computer hard drive.

5. Enter additional information in the caption fields regarding where and when the photo was taken. What you feel is interesting about the focus of the image, etc. What/who the photo shows. *Please do not “tag” anyone in your photos, this will make the photo available to others outside of the private group.*
6. Select “Post” to post the photo(s) to your personal data collection page.

Completing Your Personal Data Collection Package

Thank you for agreeing to help us in this study.

- Remember, this is just like *your* diary. We are interested in finding out as much as possible about your ideas and experiences with apparel. So please, tell us as much about yourself as you can, no matter how unimportant it may seem. If you are not sure whether to tell us something, please include it—we would rather have too much information than too little.
- Please don't worry about spelling or grammar—but try to explain your thoughts as clearly as you can.
- Please do your best to answer all questions within 24 hours of when they are posted. Some questions serve to collect basic information that will help inform the direction of the study, others seek specific personal observations and honest reflections—all questions are important and essential to help us understand you and your needs.
- For optional “Daily Observations”: Post your thoughts, attitudes, observations regarding something you did, saw, or experienced that day related to clothing. Try to write a post at least once a day. If you are able, record your thoughts as soon as possible. If you cannot make an entry for a particular day, then you can fill it in the following day. However, do not try to fill the diary in more than one day after the entry's original date—for example, don't try to recall information from Monday to record on Wednesday.
- If you realize that you have missed several days of entries, don't give up on the whole process! Just proceed from the next day that you are able to fill it in, please do not attempt to recall the previous days.
- After two days of missed responses you will be reminded to return to the data collection webpage via email. If you do not return to the data collection page within two days of the reminder email you will be dropped from the study and will not receive compensation.

If you have any questions about the diary please contact Erin Monfort-Nelson via email emonfort@ksu.edu or phone (620)-380-1186—please leave a message with your phone number and I will call you back so that you do not have to pay for the call.

Tell Us About Yourself

It is important that we understand who you are and how your personality may influence your lifestyle. Please respond to the questions. Feel free to upload drawings or photos of anything that you would like to give a visual representation of.

- 1. Describe yourself:**
- 2. What are your interests, hobbies, activities?**
- 3. What/who do you value most? Why?**

Feel free to add a photo, drawing, or collage but please also explain in writing what this means to you.

- 4. What action/behavior do you find most annoying in others?**
- 5. When observing others, what action/behavior makes you think “I will never do that!”?**
 - What about it makes you feel this way?**
- 6. What action/behavior do you do that you think more people should also do?**
 - Why do you think this?**
 - Why do you believe others don’t do this?**

Attitude on Clothing

It is important for us to understand what you think about clothing, fashion, and how it relates to your life. Please tell us more about your own attitudes on apparel. Feel free to share sketches, images, or additional writing on anything that you would like to explain in more depth.

7. How important is your clothing to you?

- **Why?**

8. How much of your impression of others is based on the clothing that they wear?

- **Why?**

9. What do you consider to be fashionable about yourself?

10. What do you think others consider fashionable about you?

11. How often do you purchase apparel items?

Example: “Weekly”, “Monthly”, “Seasonally”

12. What motivates you to purchase clothing?

Acquisition Habits

13. Where / How do you shop for clothes?

14. What apparel brands do you often purchase?

- **Tell me about specific items you purchase from certain brands?**

15. What do you look for/consider when shopping for clothes? Why?

Examples are: "fit" "brand" "price" "uniqueness" "care methods" "materials" "color"

16. Would you rather have several inexpensive t-shirts or two-three expensive t-shirts?

Why?

17. How often do you shop for sales when clothing shopping?

18. How often do you use coupons or store promotions when clothing shopping?

19. What do you like vintage/retro styles?

20. Where and how often do you shop for vintage clothing?

21. Where and how often do you shop for second-hand clothing?

22. Where and how often do you swap clothing with friends?

23. Why do or why don't you wear previously owned/used clothing?

24. How often do you consider purchasing clothing that can be worn in multiple styles?

25. Do you own any clothing that can transition from one style to another?

- **How does it transition?**
- **How often do you change the style of the garment?**

26. How often do you modify your clothing so that it can be worn differently than it was originally designed?

27. Care & Use

It is important for us to understand how you store and care for your apparel items.

Please respond to the questions.

What is your housing situation: **Dorm** **Apartment** **House** **Greek house**

Do you rent/own/other?

How many other people do you live with?

Do you live with any family members? **Y / N**

If yes, who? *Example: Mom, Dad, Domestic Partner*

Do you share any clothing storage areas?

Example: "Yes, I share my bedroom closet."

If yes, please tell us more about the space you share? Please take a photo of any shared clothing storage spaces.

With whom do you share it?

How do you share the space?

Describe the shared space:

How does it feel?

Is there enough room or maybe too much?

How do you store your clothing items?

If no, please tell us more about your clothing storage spaces? *Please take a photo of any clothing storage spaces.*

How do you store your clothes?

How easily do you manage your clothing storage?

Describe your ideal apparel storage solution:

Care & Use

28. How do you care for your apparel?
29. How often / Under what circumstances do you launder your apparel?
30. Where do you wash your apparel? *Please upload a picture of your laundering system/location.*
31. How often do you have apparel items dry-cleaned/professionally laundered?
32. When do you repair damaged clothing items? *Please upload a picture of any items that you have personally repaired.*
 - How?
33. When do you have clothing items professionally repaired or altered?
 - Why or why not?
34. What do you do with apparel when it is no longer your size?
35. What do you do with apparel when it is no longer in style?
36. What do you do with apparel when it becomes damaged?
37. How do you feel when a favorite item “wears out”?
38. When might you attempt to re-design garments to create a new style? *Please take a picture of an item that you wish were re-designed?*

Disposal

39. *Please upload a photo of a garment that you have decided to dispose.*

40. **How many times do you wear apparel items before you dispose of them?**

- *Does it depend on the type of item? Or the item's purpose? Please explain.*

41. **How often do you dispose of apparel items?**

42. **How do you dispose of apparel items?**

Environment

It is important for us to understand what you think about the environment and how it relates to your life. Please respond to the questions. Feel free to share sketches, images, or additional writing on anything that you would like to explain in more depth.

- 43. What about yourself do you consider to be eco-conscious? *Please explain.***
- 44. What do you recycle?**
- 45. How often and how do you recycle?**
- 46. What kinds of items do you re-use for reasons other than the original purpose?**
Please take a photo of any items that you are re-using to serve a new purpose.
- 47. What do you know about the current state of the environment?**
- 48. How often do you purchase organic products and what kinds of products do you purchase? *Please upload a photo of any organic apparel products you own.***
- 49. Why or why don't you purchase organic products?**
- 50. What other environment-friendly materials do you shop for?**
- 51. Please list any apparel brands that you believe are environmentally friendly and tell us why.**
- 52. What do you know about apparel production?**
- 53. Do you know of any environmental or social impacts caused by the production of clothing?**
- 54. What do you look for when purchasing apparel that makes you feel like you are “doing good” or contributing to social or environmental causes?**
- 55. What fabrics/materials do you believe are more environmentally friendly?**

56. What are you interested in learning more about regarding the apparel industry and the environment?

Future

57. What future goals or plans do you have? How do you believe apparel will influence your ability to achieve those goals?

Daily Observations

We are interested in learning more about how you observe clothing on a daily basis.

Please record any thoughts you had regarding clothing today. These can be observations about your own clothing or other people's clothing. Consider keeping track of how many items you try on each day before deciding what to wear, or record each day's outfit (be specific). Please only record observations within two days of the occurrence/observation.

Please take a photo of the outfits you try on each morning and the outfit you decide to wear.

Additional Suggested Photographic Topics

- Clothing storage spaces (closets, dressers, under-bed boxes, floor, etc.).
- Laundry areas (hampers, floor, machines, drying, etc.).
- Daily outfits.
- Favorite clothing items.
- Favorite purses/bags.
- Favorite outerwear (coats, jackets, etc.).
- Style references (magazines, photos, inspiration).

Appendix B. Focus Group Session One Data Collection Materials

Included in this appendix are the research instruments:

- Researcher Focus Group Instruments
 - Focus Group Session 1. Discussion Questions
 - Focus Group Session 1. Free Word Association

Focus Group Session 1. Discussion Guide

I would like to take a moment to remind you that this is a research study of apparel consumers with a focus on environmental design strategies. Your participation is completely voluntary. During this study you may choose to stop participating at any time. Your responses will be kept confidential; only the researcher will have access to identifying information. Data will be combined and analyzed as a whole unit. Your individual responses will be totally unidentifiable in this combined format. There are no known risks associated with this project which are greater than those encountered in daily life

How many of you are satisfied with current clothing and fashion trends?

- Discuss challenges faced when dressing for the day.
- Discuss specific garments that cause unnecessary stress.

How do you handle these situations?

- Discuss consumer methods of coping with apparel displeasure.

What kind of concern do you have for the environment?

Do you feel like individually you can have an impact on the environment?

- Discuss sustainable apparel purchase decisions.
- Discuss sustainable apparel disposal decisions.

Do you feel as if any apparel producers are making it easier for you to do your part in reducing environmental impact?

- Discuss what barriers prevent environmentally sustainable apparel behaviors.

Thank you so much for your participation today, this discussion has inspired a lot of great ideas for us to begin with. We would like to meet with you all again in a few weeks to discuss solutions that we believe will reduce the environmental impact of your relationship with apparel.

At that time, you can help us design garments that will better fulfill your needs while improving environmental social responsibility. We look forward to meeting with you again soon and hope that today's session will inspire creative thought and an observant outlook on apparel decisions.

Thank you again!

Focus Group Session 1. Free-Word Association

Researcher Instructions:

This method is intended for use during initial focus group sessions as a discussion ice-breaker. Formal introductions and consent should occur prior to Free Word Association play.

The researcher will instruct the participants on how to play the “game” (see “Play Instructions”). Beginning the list of keywords at the top left, the researcher will read a word or phrase; the participants should write the first word that comes to mind. The researcher will then ask the participants to each share her word with the group, by showing her whiteboard. Each participant should share her word before continuing to the next round. The researcher will quickly record each participant’s word in the keyword response table.

The researcher may notice participants’ boredom, or saturated responses indicative of the need to move on to a different category of keywords. This is permitted to maintain focus group participation and interest. Keywords should be numbered as they are used so that the researcher can repeat the same procedure in each focus group.

Focus Group Session 1. Free-Word Association

Play Instructions: (To be read aloud.)

We are going to begin with a game of Free Word Association; this should help us all get comfortable in the group and warmed up before we dive into conversation. You each have a dry-erase board and marker in front of you. Please take a moment to print your name across the top of the board; we will be using these during the game. (*Pause*)

This game is meant to be spontaneous and fun, so try to enjoy yourself. I will begin by reading a word or phrase, after I finish please write the first word that comes to mind on the dry-erase board, then put your pen down. The game is very quickly paced so you should only take time to write one word, when everyone puts their pen down we will reveal our words to the entire group.

At that time we will go around the table, and you will each get the opportunity to say more about the word on your dry-erase board. Also if anyone in the group has a question for someone else regarding a word, we should be open and excited about sharing our thoughts with each other.

If at any point anyone feels uncomfortable about sharing or participating you have the right to cease participation. At which time you can decide whether you want to continue participation later, or leave the focus group.

Order Used	Keywords by Categories	Response:	Response:	Response:	Response:	Response:
	General: Apparel					
	Fashion					
	Clothing					
	Trends					
	Designer					
	Specific: Apparel Brands					
	The Gap					
	Forever 21					
	Patagonia					
	H&M					
	Northface					
	Top Shop					
	Levi					
	General: Environmental					
	Environment					
	Eco-Conscious					
	Green Movement					
	Recycling					
	Specific: Environmental Apparel					
	Organic					
	Natural					
	Hemp					
	Up-Cycled					
	Recycled					
	2 nd Hand					
	Vintage					
	Hand-Made					
	Local					

Appendix C. Focus Group Session Three Data Collection Materials

Included in this appendix are the research instruments:

- Researcher Focus Group Instruments
 - Focus Group Session 3. Evaluative Questions

Focus Group Session 3. Evaluative Questions

Questions about the design:

1. What do you think of the design?
2. What do you like?
3. What don't you like?
4. How could it function better?
5. How else could we improve the design?

Questions about the design concept/strategy:

6. What do you think of the design concept?
7. Do you think the design is sustainable?
8. What would make it more sustainable?
9. How else could this concept be used?

Questions about the participatory design process:

10. What did you enjoy about participating in the design process?
11. Would you like to have been more/less involved in the design process?
12. Do you feel like your participation was beneficial to the project?
13. Is there anything you wish was different about the design or the design process?
14. Could the groups have been more fun or enjoyable?
15. What did you think about the online portion of the study?

Appendix D. Proceedings Abstract

Included in this appendix is:

- Proceedings abstract for a refereed conference.

Developing Environmentally Sustainable Apparel through Participatory Design

Erin M. Monfort-Nelson, Iowa State University, USA

Kim Y. Hiller Connell, Sherry Haar, Kansas State University, USA

Keywords: practice-based research, participatory design, sustainability, design process

Many sustainable garments do not engage wide consumer interest, nor encourage eco-conscious purchasing. Meanwhile, mass consumption of unsustainable apparel contributes to environmental degradation (Black, 2008). However, Niinimäki (2010) suggests that engaging consumers in the design and development of environmentally sustainable products could improve the balance between environmental design decisions and functional, aesthetic, and emotional qualities (Lamb & Kallal, 1992).

The purpose of this practice-based research was to (a) identify apparel and environmental attitudes and consumption behaviors of potential sustainable apparel consumers, (b) generate sustainable apparel design concept and product through use of participatory design methods, and (c) evaluate the sustainable concept, product, and participatory method. The sample was 10 female university students.

Consumer data was collected through an online (i.e., Facebook) ethnographic journal and a focus group. Qualitative analysis generated the target market's ideal apparel characteristics and ideal environmental apparel characteristics as apparel offering versatility and variety within their existing wardrobes; elements expressive of their personalities; simple and inexpensive maintenance; organic or recycled materials; and less textile waste at disposal. Additionally, it was determined that participants had low knowledge of the apparel and textile industry and its environmental impacts.

Generation of sustainable apparel design ideas occurred through a second focus group session. Analysis of the focus group data, combined with the researcher's tacit sustainable design knowledge, formed a design concept. The sustainable apparel design concept was comprised of three characteristics reflective of the target market's ideals and design suggestions: be versatile through various temperatures; social settings, and environments; be convertible through temporary adjustment of functional and aesthetic elements; and be transitional allowing the garment to be layered for greater thermal insulation without detracting from the appearance. The sustainable apparel concept was an application of the pre-existing Design for User Interaction sustainable design strategy.

The sustainable apparel design concept was then applied to the development of an outerwear garment and presented to the participants and mentors as a digital sketch. The design addressed the sustainable design concept through interchangeable envelope-style shell layers, an insertable thermal core layer, a buttoned closure at the hemline and interconnecting button points for added alignment between layers. In this garment, the researcher applied participants' suggestions of style, materials, and inclusion of a core layer. Following sketch refinement, two prototypes were constructed. The first prototype consisted of a thermal core layer and outer coat layer. Due to challenges with the core layer fabric, the second prototype modified the core layer material and style. Additionally, in the second prototype, the shell was made sleeveless and both a bolero style jacket and lining were added. Dual button fasteners connected the layers.

During the third focus group session, participants evaluated the design concept, second garment prototype, and the participatory design methods. Participants noted that the design concept provided increased ease of garment care (which could potentially increase the frequency

of laundering); ease of garment storage; and increased versatility through varying temperatures. Participants' suggestions for prototype refinement included the addition of a kick-pleat and reduction of button alignment points.

Prototype development did not reach completion during this study. Further refinement of the garment's pattern and fit, implementation of additional aesthetic/functional elements, and development of an intuitive transformation are necessary. Participant evaluation of participatory methods and study participation were the use of Facebook as an online ethnographic journal made daily participation easy and allowed the researcher to become familiar with their personalities, increasing their comfort at later stages of the research. Participants felt their suggestions were evident in the garment prototype and were as involved as their experience and knowledge allowed. The only participant suggestion regarding the participatory design experience was the addition of updates informing participants of the design progress between focus group sessions. Though the concept and resulting garment were not exceedingly original, participants were pleased with the fruition of their ideas. This finding indicates a willingness to participate in the design process, supportive of participatory design.

The outcomes of this research were immediately employed to further progress the design development. However, this information could further guide additional sustainable apparel design development by professionals, researchers and design students within the apparel field. Finally, this research provides insight into the participatory design experience and details methods that could be utilized by other apparel designers. Collecting the same data from a sample with greater knowledge of previous sustainable apparel efforts could provide a wider range of ideas and perhaps more unique or creative solutions. Future research should further the

garment design through application of suggestions and critique provided during the prototype evaluation as well as apply the design concept to other apparel garments.

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Lamb, J. M., & Kallal, M. J. (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal*, 10(2), 42-47.

Niinimäki, K. (2010). Eco-clothing, consumer identity and ideology. *Sustainable Development*, 18, 150-162.