Innovating the apparel industry in the United States: Designers and small brands purchasing sustainable textiles

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Innovating the apparel industry in the United States: Designers and small brands purchasing sustainable textiles

by

Jennifer Siobhan Ingram

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Apparel, Merchandising, and Design

Program of Study Committee:
Ellen McKinney, Major Professor
   Linda Niehm
   Joanne Marshall

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University
Ames, Iowa
2019

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The purpose of this study was to explore the purchasing practices of designers and small apparel brands in the United States regarding sustainable textiles. In this study, sustainable textiles was defined as textiles composed of fibers that reduce negative environmental and social impact. Small apparel brands was defined as businesses of five or fewer full-time employees that produce small or large batch units or apparel to sell to stores or on a website to consumers. Due to the magnitude of environmental and social problems attributed to the apparel industry, both academic and industry literature have stressed the need to integrate sustainability into the entire product development pipeline, starting with textile selection. The purchasing of sustainable textiles by small apparel brands can be viewed as an innovative business practice. Rogers’ (2003) diffusion of innovation (DOI)-decision process provides a framework to understand the knowledge, persuasion, decision, implementation, and confirmation of designers and small apparel brands purchasing of sustainable textiles. The innovation-decision perspective explains how and why new ideas spread, and the factors that influence purchase decisions concerning new and alternative materials such as sustainable textiles.

Numerous publications call for designers to function as change agents (innovators) regarding sustainability and convey that small businesses can potentially implement such practices quickly. Various studies have attempted to explain why small apparel brands do not purchase sustainable textiles, but few explain why some brands do purchase such materials. Other research has addressed large United States apparel brands that have engaged in sustainable textiles, but small apparel brands have been largely ignored. Thus, a gap exists in the literature concerning what innovative sustainable textiles are being used by small
apparel brands and designers, sectors that constitute a majority of the United States apparel industry.

This qualitative study used a semi-structured interview methodology to gather responses from 14 designers or employees of small apparel brands in the United States and have purchased sustainable textiles. Participants were solicited by contacting the brands directly, posting an invitation in Facebook sustainable fashion groups, and by contacting designers directly through professional networks such as LinkedIn and the International Textile and Apparel Association. Data were analyzed using MAXQDA qualitative data analysis software.

The findings show that designers and small apparel brands do indeed function as change agents by integrating many different types of natural and manufactured sustainable textiles into materials selected for garment design and production. Most purchased these textiles because they strive to make an environmental and social impact by making sustainable textile selection as a priority. Knowledge and relative advantage of sustainable textiles and processes were key factors that positively influenced purchasing decisions. On the contrary, the factors that negatively influenced purchasing were complexity, trialability, and observability. Findings show that through independent research, designers and small apparel brands purchase textiles composed of sustainable fibers, or made through sustainable processes, online and directly from mills at tradeshows.

This research increases not only awareness knowledge, principle knowledge, and how-to knowledge, but develops a list of sustainability terms and textiles used by designers and small apparel brands. Further research can include developing a data base for sourcing with pricing and minimum order quantities, providing a labeling system for products, and
creating infrastructure for biodegrading and recycling textiles. Additional research may include further refinement of a working definition for sustainable textiles and adding environmental and social responsibility to the DOI sub-dimensions of relevant advantage within the perceived characteristics of the diffusions of innovation-decision process. This research also contributes to the fashion industry by providing practical methods for students, sewers, educators, designers, and small apparel brands to adopt sustainable textiles.
CHAPTER 1
INTRODUCTION

Problem

The magnitude of environmental and social problems attributed to the fashion industry is alarming. Three detrimental examples include pesticide poisonings, water pollution, and landfill waste. First, “the World Health Organization (WHO) suggested approximately three million pesticide poisonings occur per year, resulting in 20,000 deaths, primarily among rural, poor developing countries” (Fletcher & Grose, 2012). These developing countries typically produce plant-based fibers such as cotton. Pesticides are used to keep insects from damaging the cotton plants. In 2017, the Pesticide Action Network UK reported that the severe health impacts from pesticide exposure include impairment of the nervous system, lower neurobehavioral performance, delayed puberty, breast milk contamination, and blood abnormalities (Ferrigno, Guadagnini, & Tyrell, 2017).

Second, one of the most significant man-made environmental disasters was caused by cotton production. In August of 2017, NASA’s Terra satellite reported that “the Aral Sea in Central China, once the fourth largest lake on earth, is now approximately a tenth of its former size” (World, 2017). The water was used to irrigate cotton crops across the region. It is estimated that 40,000-60,000 fishermen lost their livelihoods, which has negatively affected the economy (Ataniyazova, 2003, p. 1). Water pollution is the leading environmental problem in this area (Ataniyazova, 2003). In northern Karakalpakstan, “most schools and hospitals, including the maternity hospital, do not provide safe drinking water” (Ataniyazova, 2003, p. 2). “The health of the people continues to be at high risk because of chronic exposure to the high levels of minerals and multiple toxins in the water for drinking”
Third, only about 10% of discarded clothing goes to charities or the second-hand clothing market. The Environmental Protection Agency (2019) reported that of the 16,030 tons of textiles generated, 10,530 tons are landfilled. In the landfill, “much of this painfully achieved product gets thrown away to be buried or burned, releasing ozone-depleting methane gasses where fibers cannot decompose properly, releasing airborne particulates,” which cause asthma (Blackburn, 2009, p. 7). Fletcher and Grose (2012) summarized these negative impacts as:

- climate change, adverse effects on water and its cycles; chemical pollution; loss of biodiversity; overuse and misuse of nonrenewable resources; waste production;
- negative impacts on human health; and damaging social effects on producer communities. (p. 13)

*Sustainable development* is meeting the needs of the present generation without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987, p. 2). Current literature supports the need for sustainable development in the fashion industry and the need for sustainability to happen in the first stage of the design process through textile selection (Baugh, 2015; Fletcher & Grose, 2012; Gullingsrud, 2017; Lawless & Medvedev, 2016). Much of the literature on sustainable apparel calls for designers to function as change agents (DeLong, Goncu-Berk, Bye, & Wu, 2013; Palomo-Lovinski, & Hahn, 2014). Related streams of literature further suggest that small to medium enterprises (SMEs) are the innovators and change makers related to new products and sustainable development (DeLong et al., 2013; Earley, Goldsworthy, & Vuletich, 2010; Fletcher & Grose, 2012; Palomo-Lovinski, & Hahn, 2014). Integration of sustainable textiles in apparel products can be considered an innovative approach for SMEs,
as they create unique value for the company, consumers, and other stakeholder groups, such as the apparel industry.

Although many sustainable initiatives have been introduced, these concepts are challenging to consistently implement due to the lack of information on sustainable textile purchasing for designers and small apparel brands in the United States. Fletcher and Grose (2012) and Baugh (2015) suggested sustainable textile options and the global impact of each textile category. In addition, Baugh (2015), Fletcher and Grose (2012), and Quinn (2015) have also identified sustainable textiles selected and sourced by larger firms such as Eileen Fisher, Patagonia, and Levi Strauss. Unfortunately, some of these textile mills have a minimum order quantity (MOQ) requirement, which means that to purchase a textile, the individual must purchase a minimum amount specified by the supplier. The MOQ for textiles is typically 500-1000 yards or more. Designers and small apparel brands that want to purchase sustainable textiles typically need no or low minimum purchase requirements. Thus, a gap exists in the literature concerning what sustainable textiles are being used by small apparel brands and designers, sectors that constitute a majority of the United States apparel industry (“American fact finder,” 2016).

Purpose

The purpose of this study was to explore the purchasing practices of designers and small apparel brands in the United States regarding sustainable textiles. Rogers (2003) diffusion of the innovation (DOI)-decision process model was utilized as a theoretical to understand the stages of knowledge, persuasion, decision, implementation, and confirmation related to the selecting and purchasing sustainable textiles by designers and small apparel brands in the United States. The innovation-decision process was deemed appropriate for
this study as it explains how and why new ideas spread. It also explains what factors influence the decision to adopt or reject an innovation. The decision to purchase and utilize sustainable textiles is considered to be a new idea or innovative practice in this study. Various studies have attempted to explain why small apparel brands do not purchase sustainable textiles, but few explain why some brands do purchase such materials. Other research has addressed large United States apparel brands that have engaged in sustainable textiles, but small apparel brands have been largely ignored. Thus, a gap exists in the literature concerning what innovative sustainable textiles are being used by small apparel brands and designers, sectors that constitute a majority of the United States apparel industry.

This research focused on sustainable textiles purchased for commercial use in apparel design and production. This information was obtained from semi-structured interviews of 14 designers or employees of small apparel brands that purchase sustainable textiles in the United States.

Relevant Definitions

The following terms are defined for use within this thesis:

- **Biodegradable**: a fiber or garment that can be broken down into a simpler substance by microorganisms, light, air, or water in a nontoxic process (Gullingsrud, 2017, p. 269).

- **Designers**: people 18 years or older that produce apparel, but have not formally set up a business of selling apparel. The designers in this study are all educators in the field of fashion.

- **Fibers**: According to Sinclair (2015), “Fibers are the foundation for all textile products and can either be natural or manufactured” (p. 3). Apparel textiles are made
from fibers. The term *textile* was used throughout this study as a synonym for cloth, fabric, and material.

- **Renewable natural resources:** are natural resources that can be replaced or replenished by natural processes or human action (Gullingsrud, 2017, p. 273).
- **Small apparel brands:** are businesses of five or fewer full-time employees that produce small or large batch units of apparel to sell to stores or on a website to consumers.
- **Small to medium enterprises (SME’s):** are firms with fewer than 500 employees (“American fact finder,” 2016).
- **Sustainability:** describes a form of economy and society that is lasting and can be lived on a global scale (Ekardt, 2019, p. i).
- **Sustainable textiles:** for the purpose of this study will be defined as textiles composed of fibers that reduce negative environmental and social impact.

**Research Questions**

To better understand the decisions of designers and small apparel brands in the United States concerning sustainable textiles, the following questions were developed according to the DOI decision-making process stages:

1. **Knowledge:** In the United States, what do designers and small apparel brands know and understand about the concept of sustainable textiles?
2. **Persuasion:** What persuaded these designers and small apparel brands to form a favorable attitude toward sustainable textiles?
3. **Decision:** What activities led to the choice to adopt sustainable textiles?
4. Implementation: How do designers and small apparel brands put sustainable textiles to use?

5. Confirmation: What reinforcements do designers and small apparel brands have after purchasing sustainable textiles?

Significance

Fiber and textile selection is a sustainable practice that starts at the beginning of the design process. A wide variety of designers, sewers, students, and small apparel brands select textiles daily without considering the impact of their choices. This research contributes significantly to the fashion industry by attempting to answer what, why, and how designers and small apparel brands in the United States innovate through the selection, purchasing, and integration of sustainable textiles in their products. The study also attempts to explain positive and negative factors that influence the adoption of sustainable textiles as an innovation, based on Rogers (2003) DOI framework. Findings suggest theory-based conclusions and implications for the diffusion of innovative, sustainable practices among small apparel brands. Recommendations for future research and business assistance to small apparel brands stem from the findings.

In addition, this thesis also highlights the scope of designers and apparel brands that have adopted sustainable textiles. A goal of this research was to become an information source for designers and small businesses that want to adopt and purchase sustainable textiles, but have problems when trying to research and source them. Sharing this information aids designers, small apparel brands, industry professionals, and fashion educators will spur innovative practices and aid in overcoming the challenges of adopting sustainable textiles in the pre-production stage of the apparel lifecycle. This research
attempts to increase not only awareness knowledge, principle knowledge, and how-to knowledge, but to develop a list of sustainability terms and textiles used by designers and small apparel brands. Such knowledge will allow designers and small apparel brands to have a more significant impact on preserving the earth’s natural resources. In conclusion, if more sustainable textiles are adopted, the apparel industry could improve global sustainability by reducing water usage, chemical pollution, biodiversity, renewability, waste in landfills, negative impacts on human health, and damaging social effects on producer communities.
CHAPTER 2
LITERATURE REVIEW

Integrating Sustainable Practices in Apparel Design

The apparel industry causes a multitude of environmental and social problems (Fletcher & Grose, 2012). To resolve these issues, sustainability must be integrated into the entire product development pipeline, starting with fiber selection. Sustainability theory and current practices in the apparel industry are examined to understand current practices as well as gaps in the literature.

Due to their agile nature, small businesses are quickly able to implement changes in textile sustainability practices (DeLong et al., 2013; Earley, Goldsworthy, & Vuletich, 2010; Fletcher & Grose, 2012; Palomo-Lovinski, & Hahn, 2014). As selectors of fibers, designers can be sustainability change agents (innovators). The choice to use sustainable textiles is an innovative approach for SMEs. This approach can create unique value for the company, consumers, and other stakeholder groups such as the apparel industry. Thus, the study and literature review are framed by two theories—sustainability and diffusion of innovation.

The Theory of Sustainability

Due to the alarming adverse environmental and social problems caused by new technological developments, integrating sustainable practices is a necessity for many industries. To integrate sustainable practices, one must understand the theory of sustainability. Sustainability describes a form of economy and society that is lasting and can be lived on a global scale (Ekardt, 2019). Sustainability is a term often used, but not consistently defined (Gullingsrud, 2017). Sustainability is about making products that serve useful market and social functions, with lower detrimental environmental impact than the
currently available alternatives (Farrington, Lunt, Davies, & Blackburn, 2005).

Sustainability is not an invention of the late 20th century. It is deeply rooted in many previous cultures. Yet, the 20th century stands out because of major technological and scientific progress that has impacted the development of consumer products and consumption behavior (Quinn, 2015, p. 349).

Environmental, economic, and social sustainability are known as the three pillars of sustainability and form the main topics considered in sustainable fashion design (Gibson, 2006). Carbon ecology defines these as environmental sustainability, which means that we are consuming our natural resources (e.g., materials, energy fuels, carbon, land, water) at a sustainable rate. Economic sustainability requires that a business or country uses its resources efficiently and responsibly so that it can operate to produce a consistent operational profit. Social sustainability is the ability of society, or any social system, to persistently achieve good social well-being.

![Figure 2.1. Sustainability Venn diagram. Source: Circular ecology.](image-url)
Sustainable apparel must be environmentally friendly, socially responsible, and economically profitable. Capturing all three areas of sustainability is the triple bottom line (Quinn, 2015, p. 348). This comprehensive approach to sustainability is challenging for most firms. Many apparel brands start with the economic pillar through determining a desired profit margin and then incorporating the social pillar through working with fair trade factories. “Too often, companies fall into the trap of treating environmental issues as an afterthought to be addressed once the concept is established” (Fiksel, 2009, p. 10).

“Environmental sustainability is compatible with economic development” (Fiksel, 2009, p. 3).

Some of the afterthought environmental solutions are using deadstock fabrics, selling at second-hand stores, and upcycling. Although these options may slow the waste build up, they do not change the environmental impact from the beginning of the product lifecycle. Typically, the environmental pillar is the last and most challenging pillar of sustainability to implement. Environmental sustainability focuses on the goal of preserving nature’s resources. “Environmental sensitivity has moved from being a luxury to a necessity” (Fiksel, 2009, p. 18).

The global fashion market is valued at three trillion dollars and employs up to 57.8 million people worldwide (“Global fashion industry statistics,” 2016). Due to the global scale and the vast environmental and human resources required for the production and consumption of products, the fashion industry has a tremendous impact on the global environment (Caniato, Caridi, Crippa & Moretto, 2012). The current fashion industry paradigm is to get the best products for the lowest price and the fastest time (Black, 2011; Lawless & Medvedev, 2016). Manzini (2006) wrote, “presently, 20% of the population is
consuming 80% of available resources” (p. 13). He predicted that if Western consumption habits were adopted on a global scale, an ecological and/or social crisis would result. This would be detrimental to the world. After the documentary True Cost, by Andrew Morgan, many of the negative impacts of the fashion industry were brought to light.

**Apparel Product Lifecycle Sustainability**

Product lifecycle sustainability is an approach to managing the stages of a product’s existence so that any negative impact on the environment is minimized (Rouse, 2013). Apparel products are managed throughout the five lifecycle stages, which include pre-production, production, distribution, utilization, and end-of-life (Lawless & Medvedev, 2016, p. 43). Figure 2.2 shows a diagram of the five stages. In the pre-production stage, textiles and trims are selected, and dyeing, printing, and finishing of the fabric take place. In the production stage, apparel is manufactured in sizes, colors, and number of units and packaged. In the distribution stage, the products are shipped to distribution centers or retailers, and the retailer sells it to the consumer. In the utilization stage, consumers wear the products and maintain these products through washing, dry cleaning, and sometimes repairing. In the end-of-life stage, the products are disposed of in various ways.

![Figure 2.2. Apparel product lifecycle. Source. Lawless & Medvedev, 2016.](image-url)
Each stage of the lifecycle will have environmental, social, and economic impacts, such as the availability and efficient use of materials, energy, and water (Quinn, 2015, p. 348). The problem with the current apparel lifecycle is that many of these environmental and social impacts are negative and do not support sustainability. Although sustainable considerations should take place at all stages in the apparel product lifecycle, the literature (McDonough & Braungart, 2008; Fletcher & Grose, 2012; Baugh, 2015; Gullingsrud, 2017) suggests that it is important to start with fiber selection. While some larger apparel firms (e.g. Patagonia, Eileen Fisher) are focusing on enhanced sustainability efforts, the broader industry is in need of an overhaul. Some smaller brands are engaging in the use of sustainable textiles and practices, but their efforts are lesser known. This study focuses on the innovative practices of small apparel brands concerning their selection and use of sustainable textiles. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption . . . If an idea seems new to an individual, it is an innovation (Rogers, 2003, p. 12). This research posits that use of sustainable textiles versus others available in the vast global market constitutes a form of innovation. Thus, the innovation-decision process model is used as a theoretical framework to understand small apparel brands decisions to purchase sustainable textiles.

The Diffusion of the Innovations-Decision Process Model

Material-led sustainability innovation tends to fall within the control of most designers and buyers, slotting effortlessly into established working practices and the industry status quo without even demanding ground-shaking business reform (Fletcher & Grose, 2012, p. 13). There are designers and small apparel brands that have gone against the status quo regardless of the challenges material-led sustainability innovation may present. This
research addresses what, where, how, and why designers and small apparel brands made the
decision to innovate through the use of sustainable textiles. This study also shows how
designers and small apparel brands have overcome the challenges faced with purchasing
sustainable textiles for their products.

“The innovation-decision process is demonstrated when an individual (or other
decision-making unit) passes from gaining initial knowledge of an innovation to forming an
attitude toward the innovation, to making a decision to adopt or reject, to implementation of
the new idea and to confirmation of this decision” (Rogers, 2003, p.168). The model of the
innovation-decision process provides a useful framework to understand the factors
influencing designers and small apparel brands to adopt the innovation of sustainable textiles.
This model occurs through five stages: knowledge, persuasion, decision, implementation, and
confirmation (Figure 2.3).

![Figure 2.3. Five stages in the innovation-decision process.](image-url)
The knowledge stage “occurs when the individual (or other decision-making unit) is exposed to an innovation’s existence and gains an understanding of how it functions” (Rogers, 2003, p. 169). “Hassinger (1959) argued that individuals seldom expose themselves to messages about an innovation unless they first feel the need for innovation” (Rogers, 2003, p. 171). Rogers (2003) contradicted this by suggesting that innovation exposure happens through awareness—knowledge of an innovation can happen by accident or by initiating it.

Roger further explained:

A need is a state of dissatisfaction or frustration that occurs when an individual’s desires outweigh the individual’s actualities . . . Innovations can lead to needs as well as vice versa. Change agents may create needs among their clients by pointing out the existence of desirable new ideas. Thus, knowledge of the existence of an innovation can create a motivation to learn about it and, ultimately, adopt it. (p. 172)

Designers and small apparel brands are being called on as change agents, so knowledge is one of the first assessments in the Rogers innovation-decisions process. Rogers (2003) then explained that there are “three types of knowledge regarding an innovation, awareness-knowledge, how-to knowledge, and principles knowledge” (pp. 172-173). First, “awareness-knowledge, information that innovation exists” (Rogers, 2003, p. 173) asks the question, “What is the innovation?” (Rogers, 2003, p. 172). Second, “how-to knowledge consists of information necessary to use the innovation properly” (Rogers, 2003, p. 172) and asks the question “How does it work?” (Rogers, 2003, p. 172). Third, “principles knowledge consists of information dealing with the functioning principles underlying how an innovation works” (Rogers, 2003 p. 173) and asks, “Why does it work?” (Rogers, 2003 p.
172). This research addressed these questions to understand the types of knowledge that
designers and small apparel brands need to possess related sustainable textiles.

Most change agents concentrate their efforts on creating awareness-knowledge
(Rogers, 2003, p. 173). Many people are spreading awareness of the innovation of
sustainable textiles, but this is not enough. Change agents could perhaps play their most
distinctive and important role in the innovation-decision process if they concentrated on how-to
knowledge (Rogers, 2003, p. 173). For instance, this study not only asked what
sustainable textiles are but how to find information for purchasing them. Change agents also
need to understand the principle knowledge of why this innovation of sustainable textiles
works. These three concepts are essential to change agents for designers and small apparel
brands to seek knowledge of sustainable textiles. Knowledge profoundly impacts the
innovation-decision process. Regarding knowledge, Rogers (2003) explained:

Knowing about an innovation is quite different than using it. Most individuals know
about many innovations that they have not adopted. . . . Consideration of a new idea
does not go beyond the knowledge function if an individual does not define the
information as relevant to his or her situation. (p. 174)

Once designers and small apparel brands are exposed to knowledge of sustainable
textiles, they must then form an attitude about the innovation. The persuasion stage is “when
the individual forms a favorable or unfavorable attitude toward the innovation” (Rogers,
2003, p. 174). The primary type of thinking in this state is affective or (feeling; Rogers,
2003). “The individual actively seeks information about a new idea, decides what messages
he or she regards as credible, and decides how he or she interprets the information received”
(Rogers, 2003). Here, the individual wants to know the answer to the question, “What are
the innovation’s advantages and disadvantages in my situation?” (Rogers, 2003 p 175). This information is “sought by most individuals from their near peers’ subjective opinions of the innovation (based on their personal experience with adoption of the new idea) are more accessible to convincing to them” (Rogers, 2003, p. 175). Peers in this instance would include other designers and small apparel brands that have gone through the knowledge and persuasion stages related to sustainable textile selection and use.

In the persuasion stage, the five perceived characteristics of an innovation are introduced. These characteristics influence persuasion to adopt the innovation. They are “relative advantage, compatibility, complexity, trialability, and observability” (Rogers, 2003, 175). Relative advantage is “the degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers, 2003, p. 229). It “is positively related” to adoption (Rogers, 2003, p. 233). Rogers (2003) also stated that “this is often expressed as economic profitability” (p. 229). In relation to sustainable textiles, economic profitability, and cost will have a greater impact on relative advantage due to the industry being so competitive and economically driven. Social and environmental profitability do not have immediate results that can be tracked; so, it tends to be lower as a relative advantage. “Sub-dimensions of relative advantage include economic profitability, low initial cost, a decrease in discomfort, social prestige, a savings of time and effort, and immediacy of reward” (Rogers, 2003, p. 233). These sub-dimensions can explain why sustainable textiles, have not been readily adopted by designers and small apparel brands.

“Compatibility is the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters” (Rogers, 2003, p. 210). It “is positively related” (Rogers, 2003, p. 249) to adoption. Designers and small apparel
brands need to feel that the textile composed of sustainable textiles is compatible with the values of the brand, previously used fibers, and to which it meets a felt need. “Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use” (Rogers, 2003, p. 257). It “is negatively related” (Rogers, 2003, p. 257) to adoption. Sustainability alone is complex due to its unclear meaning; therefore, sustainable textiles are complex to understand. Rogers (2003) explained, “for some new ideas, complexity is a very important barrier to adoption” (p. 257). “Trialability is the degree to which an innovation may be experimented with on a limited basis” (Rogers, 2003, p. 258). It is “positively related” (Rogers, 2003, p. 258) to adoption. Trialability, as it relates to sustainable textiles, would allow designers and small apparel brands to obtain textile samples and purchase textiles at lower minimum order quantities to try out. Lower minimum order quantities would allow designers and small apparel brands to try out textiles more easily, which could lead to adoption. During this process, the textile may be further customized and changed during its trial. “Observability is the degree to which the results of an innovation are visible to others” (Rogers, 2003, 258). It “is positively related” (Roger, 2003, p. 258) to adoption. The innovation of sustainable textiles is challenging to observe or to describe to others. Consumers may not know that sustainable textiles are being used; so, designers and small apparel brands are listing information on websites and hang tags of apparel. Based on Rogers’ perceived characteristics, relative advantage, compatibly, trialability, and observability, all are positively related to the adoption of an innovation. Complexity is the only characteristic that negatively related to the adoption of an innovation.

The decision stage is “when the individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation” (Rogers, 2003, p. 169).
Adoption is a decision to make full use of the innovation as the best course of action available (Rogers, 2003). This study only concentrated on the designers and small apparel brands that made the choice to adopt the innovation. Rogers 2003 suggested, “small-scale trial is often an important part of the decision to adopt” (p. 177). Small-scale trial, as it relates to textile goods, would mean 0- to 10-yard minimum order requirements.

The implementation stage is “when the individual puts an innovation into use” (Rogers, 2003, p. 179). Textiles made from sustainable textiles are put to use when the apparel is made. Designers and small apparel brands can determine if there are limitations in how sustainable textiles can be used in apparel. Questions that arise during this stage are: Are these sustainable textiles able to be used in a variety of merchandise categories? Can the end product be marketed to a variety of consumers? Is there a range of price points offered in the apparel using these textile goods?

The confirmation stage is “when the individual seeks reinforcement for an innovation-decision already made but may reverse the decision if exposed to conflicting messages about it” (Rogers, 2003, p. 179). This study views confirmation of the innovation by determining if participants are satisfied with their sustainable textile decisions and if they would recommend the innovation to others. Overall, applying the innovation-decision model provides a useful framework for understanding the factors that affect the decision to purchase sustainable textiles by designers and small apparel brands.

**Diffusion of Innovations and Small to Medium Enterprises (SMEs)**

A range of studies have applied the diffusion of innovations in SMEs to assess the adoption of information technology, e-business, and technology as innovations in small businesses. For example, Van Akkeren and Cavaye (1999) studied the various models used
in research for the adoption and diffusion of information technology in SMEs. This research found that factors related to owner/manager characteristics, firm characteristic, and other characteristics led to the choice of whether to adopt the innovation of information technology. Later, Spencer, Buhalis, and Moital (2011) also assessed the diffusion of innovations theory and the technology acceptance model, and explored factors influencing the decision to engage in technology adoption in small owner-managed travel firms in the United Kingdom. This study found that self-interest and leadership were the most significant factors influencing small owner-managed travel firms to engage in technology. On the contrary, Parker and Castleman (2009) critiqued the diffusion of innovations theory and its ability to provide a lens describing the nature of small firms and their e-business adoption decisions. The article stated that “Rogers (2003) is the most commonly cited author on diffusion theory in the SME e-business literature although he did not address e-business directly” (p. 6). E-business adoption research suggests individual decision processes are more relevant to small firms because owners are often the primary decision makers. The findings from this research suggest that no theory adequately explains the small firm adoption of e-business because it omits important and subtle aspects of small firm operation. Although these three studies are in a different field, the literature shows that this diffusion of innovations theory is commonly used for analyzing innovations in SMEs.

Some studies go even further to research the adoption of environmental, green, and corporate social responsibility innovations in SMEs. For instance, Halila (2007) attempted to improve the understanding of the adoption of environmental innovations by SMEs and how to facilitate the adoption process. The findings from this study show that adopting an
environmental innovation is not an easy task for small organizations such as SMEs but to be part of and use the network is a possible way to facilitate the adoption process.

Relatedly, Weng and Lin (2011) suggested a model that analyzes factors influencing the adoption of green innovations for the SMEs. The study found that technological characteristics of green innovations, organizational characteristics, governmental supports, customer pressure, and regulatory pressure have significantly influenced green innovation adoption for SMEs while the influence of environmental uncertainty is not significant. Additionally, Hsu and Cheng (2012) applied the innovation diffusion theory to analyze the impact of perceptive characteristics on the willingness of small and medium enterprises to engage in corporate social responsibility (CSR) in Taiwan. Results from this study demonstrated that the characteristic of compatibility has a strong and positive influence on the willingness of SMEs to engage in CSR. In conclusion, these studies show that the diffusion of innovations theory is not only used in SME research, but it is also used to analyze the adoption of sustainability-related innovations. Overall, these articles show that SMEs go through the diffusion of the innovation-decision-making process stages as applicable to their specific business. In some cases, additional characteristics may be added to the theory to explain better how it applies to innovations in SMEs in contrast to large firms.

Small Apparel Brands in Apparel Industry

There is limited literature concerning small apparel brands that adopt the innovation of purchasing sustainable textiles. SMEs make up the majority of the apparel firms in the United States. The U.S. International Trade Commission and SBA’s Office of Advocacy defined SMEs as firms that employ fewer than 500 employees (USITC, 2010). The apparel
manufacturing code for NAICS is 315, which includes a diverse range of establishments from manufacturing a full line of ready-to-wear apparel to custom apparel (SIC codes, 2018). As of 2016, this sector has 6,262 establishments with 6,253 being firms with fewer than 500 employees, classifying the majority as SMEs (“American fact finder,” 2016). The other NAICS code that SME apparel brands may fall under is Clothing Stores 4481 (SIC codes, 2018). This industry group comprises establishments primarily engaging in retailing new clothing (SIC codes, 2018). As of 2016, 96,431 of the 96,465 establishments had fewer than 500 employees (“American fact finder,” 2016). These statistics showed that the majority of firms in the apparel manufacturing and apparel clothing stores were considered SMEs.

In another report provided by the PrivCO database, of 190 private apparel and accessory retail firms included in the review, 132 were SMEs. Due to their flexibility and adaptability, SMEs are more agile innovators than their larger counterparts (Halme & Korpela, 2014). As more stakeholders convert to sustainable practices, others are expected to feel the necessity to consider these concepts, and as more companies offer to name and market sustainable best practices, others may follow (DeLong et al., 2013).

**Designers as Change Agents**

To ask designers to use sustainable textiles is challenging. Presently, there are no clear and consistent guidelines on what they are and how to put them into practice. Designers may not be aware of how choosing a textile can have negative environmental, social, and economic impact, as well as the lifecycle management of the apparel item. “Designers should be able to understand the environmental issues within their own practice, even if they are not required to do so by their employers” (Sherburne, 2009, pp. 3-32). Understanding environmental issues related to fashion is challenging. Scholars suggested
that it is imperative for fashion designers to understand critical phases within the lifecycle of a garment due to their strategic position as initial decision makers in the product development process (Fletcher & Grose, 2012; Palomo-Lovinski & Hahn, 2014).

Depending on the employer, changing the current practices can also be a challenge. “Designers do not have the power to implement environmental changes in the production of products because much of their work is confined by a brief that is set by the employer, unless of course, they run their own business, where arguably they may have the freedom and flexibility to make their own changes” (Sherburne, 2009, pp. 3-32). Most businesses are locked in economically competitive chains of supply and demand and are not easily able to make unilateral changes to their methods or products. It is estimated that up to 80% of a product’s environmental and economic cost is determined in the design stage (Fletcher & Grose, 1999; Lawless & Medvedev, 2016). The product development stage is the point at which it is possible to address a number of factors that help determine the positive or negative sustainability impact of a fashion product (Lawless & Medvedev, 2016). Understanding the lifecycle impact of each textile helps designers make informed decisions when selecting fabrics and materials for the brand.

The sustainable development literature calls for designers to function as change agents because of the decisions they make in the pre-production stage of the apparel lifecycle. Relevant to the present study, this specifically includes decisions concerning sustainable textiles. In the pre-production stage, fibers are determined by the apparel designers. Small to medium-sized firms have more control over the fibers sourced in the pre-production stage than designers at large firms. “Designers who are working in small companies expressed the belief that they had more opportunities to connect with the whole
process and think about supporting efforts toward sustainability” (DeLong et al., 2013, p. 68). Designers are considered change agents for two primary reasons. The first being their role in the lifecycle of a fashion product and the second being their role in the fashion industry. Since designers are the first decision makers in the product lifecycle, it is imperative that they understand sustainability. “Designers influence and shape the material world” (Fletcher & Grose, 2012, p. 12).

Sustainability should be the driver of the product design. “It is estimated that up to 80% of a product’s environmental and economic costs are determined in the design stage” (Fletcher & Grose, 1999, p. 8). Research suggests that the decisions made in the design stage of a fashion garment have a significant impact on the sustainability cost of a product’s lifecycle, including pre-production, production, distribution, use, and end-of-life stages (Armstrong & LeHew, 2011; Lawless & Medvedev, 2016). All of these facts emphasize the importance of designers as the change agents in implementing sustainability into the product lifecycle.

From the perspective of designers, “the concept of sustainability has remained somewhat abstract—good in theory but confusing in practice” (DeLong et al., 2013, p. 9). There is a need for continual sharing of sustainable practices in fashion and to enhance the education for fashion designers. “Now, it is time to ask decision makers in the apparel industry (i.e., designers, merchandisers, and leaders of a corporation) to reconsider their fiber selection priorities first, for their easily renewable sources and minimal negative impact on the environment, and second, for the aesthetic and performance values” (Baugh, 2015, p. 314). “Designers from small to large firms are interested in ways to encourage sustainability through best practices” (DeLong et al., 2013, p. 9). Being a sustainable designer is complex,
but fashion designers are capable of solving more complex problems related to the industry. Currently, sustainable fashion designers fight an uphill battle as they work against unsustainable industry practices and expectations and cope with inadequate options in sustainable industry practices.

Designers in small firms have an advantage over large apparel firms because they have the power to impact the entire fashion product lifecycle from concept to end-of-life. A small design business can also be an effective change agent, as these business structures are nimble and adaptable and can present completely new models of operation that collectively influence mainstream culture over time (Fletcher & Grose, 2012, p. 155). Rogers (2003) also supported this by saying, “innovations requiring an individual-optional innovation decision are generally adopted more rapidly than when an innovation is adopted by an organization” (p. 221). In larger firms, designers are not always the decision makers in every step of the fashion design, development, and production process. In many contexts, “this role is more complex than traditional design activities and involves intense negotiation and steering a course between stakeholders and the need to take practical action” (Fletcher & Grose, 2012, p.156). Other stakeholders may decide on textiles mills, production factories, and intended markups. “As more stakeholders convert to sustainable practices, others may feel the necessity to consider these concepts, and as more companies offer to name and market sustainable best practices, others are expected to follow” (DeLong et al., 2013, p. 6).

Fletcher and Grose (2012) state:

For those designers actively engaging with the process of sustainability, their practice often follows a route alert to both economic and enviro-social goals, sometimes working to reconcile them, at other times trying to transform one with knowledge of
the other and at still others, holding tension between these goals to foster change. . .

When designers devise a way to influence the sustainability direction of the companies they work for, they often meet with a wall of resistance” (Fletcher & Grose, 2012, p. 155).

The designers who cannot influence their companies to change may decide to start their own firms. “Working independently offers means of release from the established corporate culture and enables designers to direct their practice based on their own ethics and goals” (Fletcher & Grose, 2012, p.176). This research explored specific practical textile sourcing resources for small to medium-sized enterprises.

Integrating Sustainable Practices Through Fiber Selection as an Innovation

Fiber content of textiles is determined in the pre-production stage of the apparel product lifecycle. Some scholars stress the need for integrating sustainable practices through fiber selection. For example, Fletcher and Grose (2012) explained:

The sustainability issues influenced by a garment’s textile include the full gamut of impacts: climate change; adverse effects on water and its cycles; chemical pollution; loss of biodiversity; overuse and misuse of nonrenewable resources; waste production; negative impacts on human health; and damaging social effects on producer communities. (p. 13)

Baugh (2015) agreed with Fletcher and Grose by affirming, “now this is the time to add fiber choice to the initial textile decision-making process because it is clear that fiber choice has a significant impact on a healthy and clean environment” (p. 315). Baugh (2015) continued by saying, “the apparel industry has the responsibility to recognize how fiber choice will impact the environment in our global economy” (p. 313).
Textile Selection Process

Within the first step of the design process, designers research textiles to use in the collection. Depending on the size of the firm, textiles are selected by the designer or the fabric-sourcing department. These professionals attend textile trade shows to purchase textiles. “Most designers are trained to choose fabrics based on aesthetic consideration alone” (Baugh, 2015, p. 314). In addition to the aesthetics, these designers must also consider the cost and function of the textile. Sherburne (2009) explains:

The price point for a product is the single most important aspect. In current practice, a designer might be given a cost-benefit analysis between the currently available resources and the required product and price point where it enters the marketplace. The product must sell, be affordable, fit the purpose, and be desirable, or else the company cannot survive (pp. 3-32).

Textile Production

Textiles are produced through five major segments or stages (Figure 2.4): (a) fibers are the raw materials that could be made from plants, animals, or chemicals; (b) fibers are then spun into yarns; (c) yarns are then knitted or woven to make fabric; (d) the fabric is typically dyed and/or printed; and (e) some fabrics are finished, which is when chemicals are added for special treatments (see Figure 2.1). “Mills and converters are the companies that make or create textiles” (Cohen & Johnson, 2010, p. 7). “A mill is a company that owns textile machinery and makes the textiles” (Cohen & Johnson, 2010, p. 7). There are mills that specialize in one production segment and sell to other mills to do the next production segment. Also, there are mills that do all five production segments and sell directly to the consumer. A converter is a company that “buys greige goods (unfinished fabrics), usually
from mills, and then has the fabric dyed or printed or finished by other companies and then sells the finished fabric” (Cohen & Johnson, 2010, p. 8). Finished textiles are sold wholesale or retail. These are the two points of access for most small designers and apparel firms, and where decisions are made concerning the innovative use of sustainable textiles. Wholesale is when textiles are sold directly from the mill or converter, in large quantities, to other companies that use the textiles to make products or sell the textiles directly to the consumer. Retail is when textiles are sold by a company that buys textiles from mills and converters and then sells them. Textiles are typically sold online, at trade shows, at retail stores or directly from the mill.

![Textile production segments](image)

**Figure 2.4. Textile production segments.**

**Types of Fibers**

Fibers are categorized into two groups: natural and manufactured. Natural fibers are those that grow in nature as a fiber. Sources of natural fibers include plants and animals. Natural fibers can be divided further into subcategories of cellulose fibers (made from plants) and protein fibers (made from animals). Common natural cellulose fibers are cotton and linen. Common natural protein fibers are wool and silk. “Manufactured fibers are made using science and technology” (Cohen & Johnson, 2010, p. 20). Manufactured fibers can be divided into subcategories of regenerated cellulose fibers (made from plant-based raw materials) and synthetic fibers (made from petroleum-based raw materials; Baugh, 2015). Common manufactured regenerated cellulose fibers include rayon (e.g., viscose, lyocell,
modal, HWM) and acetate. Common manufactured synthetic fibers are polyester, nylon, spandex, and acrylic (Gullingsrud, 2017).

Sustainable Textiles

Sustainable textiles should be environmentally and socially responsible and economically profitable. The concept of sustainable textiles has been described in a variety of ways. Fletcher and Grose (2012) described the concept as:

Interest in renewable fibers; materials with reduced levels of processing “inputs” such as water and energy; and chemicals such as processing techniques for synthetics and organic fibers; fibers produced under improved working conditions such as fully certified fair-trade fibers; and materials produced with reduced waste such as biodegradable and recyclable fibers (p. 13).

Baugh (2015) described the concept as “environmentally responsible fiber choices are not limited to natural or organically grown fibers; they also include manufactured from renewable raw materials and chemically recycled fibers whose characteristics are equal quality to virgin fiber” (p. 313). According to this description, sustainable textiles can be made from both natural and manufactured fibers. Gullingsrud (2017) described the concept as:

Materials are grown, made and “disposed of” in safe and beneficial way to all living things and the planet. Sustainability is an action. Sustainability is not only defined by the fibers we select, but also how we process and use them. (Gullingsrud, 2017, p. ix)

While most authors agree that sustainable considerations should be addressed when selecting fibers, there are mixed views on the sustainable approach for fibers. There are two
ways to approach sustainable textiles. The first approach focuses on the production stage of the textile lifecycle. This approach promotes practices that reduce environmental and social impacts by minimizing or eliminating toxic chemical pollution (e.g., air, water), consumption of natural resources (e.g., water, energy, oil, land), waste accumulation, and harm to animals.

With the consumption of natural resources and the rising levels of textile waste and overflowing landfills, the second approach is focused on the end-of-life stage in the textile lifecycle. Innovations toward a circular economy or closed-loop methods have been introduced. *Cradle-to-cradle* was developed by McDonough and Braungart (2010). Cradle-to-cradle means that all materials and products should be *biodegradable*, meaning reused as biological nutrients or *renewable*, meaning renewed as technical nutrients (McDonough & Braungart, 2002, p. 93). The goal of cradle-to-cradle is to reduce the textile waste that does not decompose properly and to reduce ozone-depleting methane gasses, releasing airborne particulates, which cause asthma. Fibers are selected based on their ability to biodegrade (naturally breakdown and decompose) or to be renewed (technically be broken down and recycled into new material). If apparel products are biological or technical nutrients, then they are considered cradle-to-cradle (Figure 2.5), which is circular and not cradle-to-grave (Figure 2.6), which is linear. The circular economy is viewed as a promising approach to help reduce global sustainability pressures (European Commission, 2014).
Both of these approaches are examples of how textile selection impacts the entire lifecycle of the garment. While some authors argue that products should be designed only for a circular economy, which means that they must be biodegradable or renewable, others agree with the circular economy but argue that raw material renewability alone does not guarantee sustainability. This argument considers not only a “material’s ability to regenerate quickly but also the energy, water, and chemical inputs producing the material requires” (Fletcher & Grose, 2012, p. 16).

There is no single solution to stainable fiber selection. “Each fiber has different impacts at different points in its lifecycle, and appropriate and actionable responses can be complex” (Gullingsrud, 2017, p. iii). “Substituting materials leads to benefits that are felt
fairly rapidly, introduced products in months and showing up in sales figures soon after” (Fletcher & Grose, 2012, p. 12). The textile exchange “Preferred fiber market report” (2018) showed the major fibers consumed globally (Figure 2.7). Polyester was the most produced fiber with a 51% share in the global market. Cotton was the second most produced fiber with a 24.5% share in the global market. Combined, these two fibers made up over 75% of fiber production and dominated the industry. All materials impact ecological and social systems in some way, but these impacts differ in scale and type between fibers (Fletcher & Grose, 2012, p. 13). “Understanding the pros and cons of the interconnectivity of the land, water, chemicals, and energy involved in producing a particular fiber is the first step to creating sustainable fiber, yarn, and fabric selections” (Baugh, 2015, p. 313).

![Pie chart showing global fiber production in 2017](image)

**Figure 2.7.** Global fiber production in 2017. Source: Preferred fiber market report.

**Pros and Cons of Natural Fibers**

Cotton is a natural cellulose fiber, and the most produced natural fiber globally. Although its sustainable advantages include being a renewable natural resource (natural resources that can be replaced or replenished by a natural process or human action; Gullingsrud, 2017), inexpensive recyclable and biodegradable, it has significant disadvantages. The disadvantages include high toxic chemical pollution and high-water
consumption. Currently, $2 billion dollars’ worth of chemicals are sprayed on the world’s cotton crop every year, almost half of which are considered toxic enough to be classified as hazardous by the World Health Organization (Fletcher & Grose, 2012, p. 22). Problems caused by high levels of toxic chemicals include: “soil, air, and water contamination,” as well as, “human and wildlife health hazards” (Gullingsrud, 2017, p. 13). As a result of these problems, organic cotton has been suggested as an alternative option. The toxicity of the organic material drops to zero in comparison to high toxicity from conventional cotton (Fletcher & Grose, 2012). “The Global Organic Textile Standard (GOTS) is recognized worldwide, and the USDA and the Federal Trade Commission now recognize the GOTS for organic labeling on apparel and other textile products” (Baugh, 2015, p. 318). GOTS-certified organic cotton textiles are highly recommended as sustainable alternatives to other cotton textiles (Baugh, 2015; Fletcher & Grose, 2012; Gullingsrud, 2017). This alternative reduces chemical usage.

High water consumption is another significant adverse impact of cotton fiber. According to Fletcher and Grose (2012), “The Aral Sea has been depleted to a fraction of its former size because of water from inflowing rivers being diverted to use for irrigation of nearby cotton crops” (p. 23). There was no sustainable textile that lowered water use for cotton listed in the literature reviewed.

Linen or flax is natural cellulose fiber made from plant stems. Its sustainable advantages include being a renewable natural resource, recyclable, biodegradable, low chemical usage, and low water consumption (Gullingsrud, 2017). Due to the low chemical usage, GOTS-certified organic linen is considered the most sustainable textile alternative to linen. This alternative reduces chemical usage.
Wool is a natural protein fiber made from sheep. Its sustainable advantages include being a renewable natural resource, biodegradable, low chemical usage, and low water consumption. Due to this fiber being made from animals, the sustainable disadvantage is animal welfare. Animal welfare monitors the living conditions and treatment of animals used to make fibers. The only alternative is to develop relationships with producers to ensure animal-friendly practices are being implemented (Gullingsrud, 2017). There is also GOTS-certified organic wool. These alternatives reduce chemical usage and animal harm.

Silk is a natural protein fiber produced by silkworms (Gullingsrud, 2017). Its sustainable advantages include being a biodegradable, renewable natural resource. The disadvantage is animal welfare. During fiber production, “the chrysalis is killed to prevent the moth from making a hole in the cocoon” (Gullingsrud, 2017, p. 72). The sustainable textile alternatives are Tussah silk and ahimsa silk because neither requires the chrysalis to be killed (Gullingsrud, 2017 p. 73). This alternative reduces animal harm.

**Pros and Cons of Manufactured Fibers**

Polyester is a manufactured synthetic fiber that is the most produced fiber globally. Its advantages are that it is durable and resistant. The disadvantages are that it is made from a nonrenewable resource (petroleum), high chemical usage, high energy usage, releases greenhouse gasses into the environment, and non-biodegradable. “Energy use is closely tied to prominent global issues such as climate change, carbon emissions, and petrochemicals” (Fletcher & Grose, 2012, p. 25). With oil prices rising and attention on the carbon footprint of each fiber, methods of recycling are being explored. “For those fibers that are recycled using the traditional mechanical methods—shredding fabric and then re-spinning fibers into a new yarn—the energy savings are also substantial” (Fletcher & Grose, 2012, p. 26).
“Estimates suggest that even the most energy-intensive forms of synthetic fiber recycling, where polyester or nylon is taken back to polymer and then re-extruded into a new product, is around 80% less energy-intensive than the manufacturing of new fiber” (Fletcher & Grose, 2012, p. 26). The sustainable textile alternative is chemically recycled polyester (Fletcher & Grose, 2012; Gullingsrud, 2017). According to Teijin Frontiers ECO_CIRCLE, “the recycled polyester requires 70% less energy to produce than new polyester” (Baugh, 2015, p. 334). This alternative reduces the depletion of virgin natural resource, energy usage, and waste accumulation.

Nylon is a manufactured synthetic fiber. Its advantages are that it is durable and abrasion resistant. The disadvantages are that it is made from a nonrenewable resource (petroleum), high chemical usage, high energy usage, releases greenhouse gasses into the environment, and is non-biodegradable. Nylon is the second highest energy-intensive fiber to produce (Fletcher & Grose, 2012). The sustainable textile alternative is chemically recycled closed-looped nylon 6 (Gullingsrud, 2017, p. 116). This alternative reduces the depletion of virgin natural resources and waste accumulation.

Spandex is a manufactured synthetic fiber. Its advantage is that it stretches and snaps back to the original shape. The disadvantages are that it is made from a nonrenewable resource (petroleum), high chemical usage, high energy usage, and non-biodegradable. Spandex is often blended with other fibers (Gullingsrud, 2017). While a blend with spandex enhances performance qualities of other fibers, spandex will prevent biodegradability when blended with natural fibers and prevent recyclability when blended with other synthetic fibers. The sustainable textile alternative is bio-based spandex, which uses bio-based sources for spandex.
Acrylic is a manufactured synthetic fiber. Acrylic has the highest energy consumption of all fibers (Fletcher & Grose, 2012). Its advantages are that it is comfortable, durable, and inexpensive. The disadvantages are that it is made from propylene gas, high chemical usage, high energy usage, and non-biodegradable. There was no sustainable textile that lowered energy use for acrylic listed in the literature reviewed.

Viscose rayon is a regenerated cellulose manufactured fiber made from wood or bamboo. Its advantages are that it is “inexpensive, silk-like,” and biodegradable (Gullingsrud, 2017, p. 156). The disadvantages are that it has high chemical usage, high energy usage, high water consumption, high pollution to water and air, and harms endangered forests. The sustainable textile alternatives are TENCEL lyocell from Lenzing or Lenzing Modal. Lyocell is made from eucalyptus trees certified by Forrest Stewardship Certification. It reduces water usage, and “operates as a closed-loop system, in which 99% of the solvent is recovered, filtered and reused” (Gullingsrud, 2017, p. 172). Lenzing Modal is “nontoxic and operates in a system where 95% of outputs are recovered, filtered and reused” (Gullingsrud, 2017, p. 180).

In conclusion, the literature suggests selecting fibers that are nontoxic, low-impact on natural resources, do not harm animals, and are biodegradable or recyclable. This process requires deciding what tradeoffs are most important to the person. Synthetic fibers; such as polyester, nylon, spandex, and acrylic; are non-biodegradable. Fletcher and Grose (2012) suggested pursuing renewable fibers as a preference for virgin nonrenewable fibers (p. 16). Gullingsrud (2017) suggested recycled fiber options such as chemically recycled polyester and chemically recycled nylon 6. Blends are another critical factor to consider when selecting sustainable textiles. Blends with synthetic fibers contribute to waste accumulation
because they do not biodegrade. Therefore, biodegradation is possible only when it is designed for and planned in advance, so that fiber blends, non-biodegradable thread, and garment trims are avoided at the outset (Fletcher & Grose, 2012). Fletcher and Grose (2012) also suggested changes for biodegradability to work:

“design of entirely biodegradable garments where all fibers and component parts compost fully and safely; development of suitable infrastructure to collect and process compostable fibers; and better information and labeling for biodegradable fibers, specifying composting routes and differences from oil-based degradable or non-degradable synthetics” (p. 20).

Conclusion and Research Questions

There is a gap in the literature regarding decision-makers’ adoption of sustainable textiles; using the DOI-decision process model was useful to gain greater understanding (Rogers, 2003). The research questions posited for this study addressed how knowledge was obtained, what designers and small apparel brands understood the innovation to be, and why this innovation was important. These questions also explored the favorable and unfavorable aspects of purchasing sustainable textiles. Reasons for why SME decision makers may or may not accept innovations related to sustainable textiles, their perceived advantages, as well as how they are implemented in their product development, are not well understood. It is posited that findings of this research could help designers and small apparel brands avoid or reduce challenges during the knowledge and persuasion stages, and increase the rate of adoption of sustainable textiles.
To better understand the decision-making process for apparel SMEs relevant to sustainable textiles, the following research questions were posed based on the DOI-decision-making process model:

1. Knowledge: In the U.S., what do designers and small apparel brands know and understand about sustainable textiles,

2. Persuasion: What persuaded these designers and small apparel brands to form a favorable attitude toward sustainable textiles?

3. Decision: What activities led to the choice to adopt sustainable textiles?

4. Implementation: How do designers and small apparel brands put sustainable textiles to use?

5. Confirmation: What reinforcements do designers and small apparel brands have after purchasing sustainable textiles?
CHAPTER 3

METHOD

A Qualitative Approach

The goal of this study was to understand the innovative use and decision processes utilized by apparel SMEs concerning the selection and purchasing of sustainable textiles. The epistemology of this study was subjectivism, which is based on participants’ personal knowledge and points of view. Interpretivism was the dominant research perspective, because the researcher and human subjects were used as the instruments to measure this issue (Collins, 2010, p. 39). The methodology was a qualitative approach to explore the sustainable textile purchasing options for designers and small apparel brands. These research choices were made to allow participants to share any experience, knowledge, details, and insights concerning the topic of sustainable textiles. The sample identification strategy used was website content analysis and the data gathering strategy used was semi-structured, in-depth interviews with open-ended questions. The resulting information provides credible resources to share with designers, educators, and students in the field of fashion. The data will aid in providing a holistic view of the innovation-decision process of involved in SME selection and purchase of sustainable textiles.

Sample

Selection Criteria and Identification

Participants were selected using a purposive sampling approach. Purposeful sampling is “the selection of participants or sources of data to be used in a study, based on their anticipated richness and relevance of information in relation to the study’s research
questions” (Yin, 2011, p. 311). Selection criteria included: (a) must reside in the United States, (b) be 18 years or older and an independent designer or primary decision maker for a small apparel brand (5 or fewer full-time employees), and (c) have purchased sustainable textiles for use in commercial apparel production. Participants were from a variety of occupations within the small brand (e.g., designer, creative directors). Designers and small apparel brands qualified for this study because both must make the conscious decision to purchase and innovate within their respective businesses. The participant is asked if they are the person responsible for the decision making for textile selection. As chief decision makers they were qualified to provide information concerning factors that influenced the selection and purchase of sustainable textiles.

The first method of solicitation used was to recruit participants from small apparel brands. First, website observations were performed to find apparel brands that sold apparel with fibers with sustainability considerations by searching the following keywords: 

sustainable apparel brands, clothing, fashion, fabrics, or textile fiber names such as, organic cotton. This search provided a list of brands and organizations that promoted sustainable textiles. Once a general list of sustainable fashion brands was collected, the next step was to examine each brands website to verify that sustainable textiles were being used. Next, was to verify that the brand was located in the United States and to verify the size of the company by using a business database or contacting the company. Any brand with five or fewer employees was considered a small brand and qualified as a potential participant. Last, the small brand was contacted to obtain the contact information for the person who made the textile purchasing decisions for the brand. Participants with experience in purchasing sustainable textiles were sought for this study due to their prior knowledge of the concept.
The disadvantages of this method were that the majority of small apparel brands did not respond to the multiple emails or telephone calls, and the follow-up process was extremely time-consuming.

A second method was used to solicit designers as participants. In this study, designers were defined as individuals 18 years or older who produced apparel, but had not formally set up a business for selling apparel. The designers in this study were educators in the field of fashion. They produce designs as a form or research or creative scholarship, with a goal of advancing apparel design knowledge. An invitation was posted on LinkedIn and on Facebook sustainable fashion groups. The invitation was also emailed directly to designers based on their professional affiliations with sustainable textiles. The advantages of this method were that the invitation was able to reach a larger population in a shorter amount of time, and participants actively contacted the researcher, which showed their eagerness to participate. This method turned out to be the best approach.

Data Collection

Institutional Review Board Approval

Iowa State Institutional Review Board approval was obtained to conduct this study (See Appendix A).

Solicitation and Interview Scheduling Procedures

Participants were solicited with an invitation email (Appendix B) and letter of consent form (Appendix C). There was a follow-up round of telephone contact with potential participants who did not respond via email to seek full participation. On the invitation letter, participants were invited to provide a personal email, or telephone number if they preferred, for study-related communication. Participants who requested email communication were
emailed the consent and questionnaire and asked to return the responses. Participants who requested phone interviews were called to verbally consent and answered questions through audio recorded interviews. Audio recorded interviews were conducted at times requested by the participants. Data were collected daily during the months of December-March. See Table 3.1 for the data collection timeline.

**Table 3.1**

**Data Collection Timeline**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Task Analysis</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected participants</td>
<td>Online of industry professionals affiliated with the topic. Create a spreadsheet of potential participants with contact information.</td>
<td>October 2018</td>
</tr>
<tr>
<td>Emailed consent forms and set up interviews</td>
<td>Sent potential participants invitational emails</td>
<td>December 2018</td>
</tr>
<tr>
<td>Sent follow-up emails and phone calls to participants who did not respond</td>
<td>Sent potential participants invitational emails and phone calls</td>
<td>January 2019-March 2019</td>
</tr>
<tr>
<td>Conducted interviews and gathered participant questionnaires</td>
<td>Conducted interviews and gathered data</td>
<td>January 2019-March 2019</td>
</tr>
<tr>
<td>Reviewed transcripts and coded data</td>
<td>Reviewed transcripts Developed coding categories from the transcript</td>
<td>January 2019-March 2019</td>
</tr>
<tr>
<td>Wrote chapters 4 and 5</td>
<td>Drafted and submitted versions to committee members</td>
<td>March 2019</td>
</tr>
</tbody>
</table>

**Interview Procedures**

Participants answered questions via email or audio-recorded telephone interview. For participants who answered questions via telephone interview, the purpose of the interview was explained, and the interviews were audio-recorded with the consent of the participant. Interviews lasted 30-60 minutes each. For participants who answered the questions via email, questions and the consent form were sent to the participants. The interview questions
related to Rogers’ (2003) diffusion of innovations theory decision-making process and are listed in Appendix D. These themes of knowledge, persuasion, decision, implementation, and confirmation came from the diffusions of the innovation-decision-making process.

To keep the participants confidential, names were not recorded. Each participant was assigned a code instead of his or her actual name. Identifiable contact information was stored separately from interview transcripts in a key linking ID code to name. Care was taken to blind or recode demographic and industry information so that participants and brands were not directly or indirectly identifiable when results were reported. Transcribing and analyzing data took place in a private location. Recordings were played in a private location with earphones for the confidentiality of the participants. All data were kept in a password-protected file, and after the data were analyzed, they will be destroyed after three years.

Data Analysis

The researcher using computer-assisted qualitative data analysis software called MAXQDA to transcribe the recordings. Transcripts from the qualitative data collected were analyzed after each interview. The researcher read the transcripts several times to code the data.

During the first cycle analysis, the data were analyzed using an exploratory method of provisional coding (Saldaña, 2015). The provisional list of codes (i.e., knowledge, persuasion, decision, implementation, and confirmation) was based on the decision-making process in the diffusion of innovation theory. The data were separated into short paragraph units that were separated by the provisional codes. During the second cycle analysis, the data were analyzed using a structural coding method for subcoding to enrich the data analysis further. Groups or patterns to determine frequencies of a subtheme categorized the data.
Each subtheme and sub-subtheme were also assigned a code. After the data were coded, they were transformed into more extended phrased themes. To check intercoder reliability, my committee chair verified the coding scheme and the coding of a representative transcript.

Results, Discussion, and Conclusions

Since two distinct types of participants (designers and small apparel brands) were included in this study, the researcher separated findings of the two groups to see if there were differences in the DOI decision-process stages. Results were reported for each research question by group. Results were discussed in terms of differences and similarities with the existing literature and the theoretical perspectives of the decision-making process of the diffusion of innovation theory, specifically knowledge, persuasion, decision, implantation, and confirmation of selecting and purchasing textiles comprised of fibers with sustainable characteristics considerations from designers and small apparel brands in the United States.

Delimitations

This study had four delimitations or boundaries that were purposely set to limit the scope of the research. The first delimitation was to apparel industry professionals had knowledge and experience in selecting and purchasing sustainable textiles in the United States, rather than all apparel professionals or apparel professionals located outside of the United States. These industry professionals had prior knowledge of the topic, experience in practice, and could provide information that was more depth in their responses. It would be too complicated to educate people without the knowledge or the desire to purchase sustainable textile goods.

The second delimitation was the selection and purchase of sustainable textiles specifically with fiber considerations in mind, and did not focus on sustainable dyeing,
printing, finishing, and other sustainable practices. As mentioned in the literature review, there are many economically and socially sustainable brands, but there are few brands practicing an environmentally sustainable selection of textiles.

The third delimitation was that only designers and small apparel brands that purchased textiles with fiber with sustainability considerations were included in the study, not larger brands. Abundant literature has been written on Patagonia and other large brands that purchase sustainable textiles, but designers and small apparel brands cannot access information and purchase on the same scale as these brands, so the process is much different.

A fourth delimitation was to only interviewing self-proclaimed sustainable brands. There are apparel brands that integrate fibers with sustainability considerations and do not call themselves a sustainable brand. A future study could also explore non-self-proclaimed brands that purchase sustainable textiles. A future study could also explore more deeply the meaning of being a sustainable brand from the perspective of SMEs.

Researcher Background

The researcher is an educator in the field of fashion design and has specific interest in this sustainability related to apparel design. The information found in this study will impact what and how the researcher teaches in classes related to the pre-production process of apparel. It also affects how the researcher teaches the concept of sustainability and textiles. Due to her prior experience as an apparel designer, the researcher understood the traditional apparel lifecycle, as well as the terminology used in the fashion design industry. This influenced the interview by allowing the researcher to communicate with the participants effectively. Due to her prior experience as an entrepreneur, the researcher understood that small design firms may have limitations in resources and may not feel comfortable disclosing
proprietary information. As an educator in the field, previously, the researcher taught the theory of textiles and sustainability without a clear understanding of the entire scope of challenges and opportunities for implementing sustainable practices for designers and small apparel brands. Her position in this study was to explore sustainable textile selection, specifically focused on fiber content considerations, and purchasing for designers and small apparel brands. The ultimate goal is for the researcher to pass this knowledge on to apparel designers and other educators who want to know more about this process.

The researcher tried to manage bias by refraining from personal opinions, staying neutral, and asking the exact interview questions throughout the data collection process. As the interviewer, the researcher tried to stay objective in the study. In the participant-observer continuum, the researcher believed she would be the observer as participant. The researcher established trust with the industry professionals, so they were willing to share information. The researcher also made sure that during the interviews, her personal interest stayed neutral.

The biases and assumptions were that industry professionals might understand the topic of sustainable textiles in apparel design to have different meanings. To control these biases and assumptions, the researcher asked each participant to explain his or her definition of sustainable textiles and sustainable textiles as they related to apparel. While interviewing the industry professionals, the researcher kept an open mind concerning how they understand sustainable textiles.

Ethics

The ethical decisions the researcher considered were the International Textile and Apparel Association code of ethics and those of the Iowa State Institutional Review Board. The researcher sought appropriate Iowa State Institutional Review Board approval. Before
the interviews, the participants reviewed and accepted the consent form from each participant, which included the standard elements that protected their human rights. The purpose of the study was explained in the invitation. The researcher set up audio-recorded interviews during the convenience of the participants. The researcher also kept participants anonymous to protect their identities. The researcher considered all of the ethical issues that could arise because of the study and addressed any issues in the most ethical way.

Validity

Due to this study consisting of qualitative interviews, the data were recorded as they were collected. The primary potential threat was intervention because there was no way to be sure that the participants disclosed all of the information asked. The participants were industry professionals who might not have shared all of their resources. Possible strategies to avoid the validity threat of intervention were to use semi-structured questions in the interviews. The questions were asked with the same level of consistency and expression to keep the reactivity consistent.
CHAPTER 4
RESULTS AND DISCUSSION

Overview

The purpose of this research was to explore the decision-making process for designers and small apparel brands in the United States that used sustainable textiles. This chapter includes a description of the participants, an overview of the major themes, findings from the research questions asked based on the DOI decision-process model, and a discussion of findings.

Participants

The participants for this study needed to (a) be designers or employees of a small brand who were 18 years of age or older, (b) live in the United States, and (c) have purchased sustainable textiles. Data were collected between January 27th, 2019, and March 20th, 2019. There were 15 participants from the 4 regions of the United States listed in Table 4.1. The data for one participant (P2) was removed due to missing qualification criteria. This participant was a fabric retailer and had purchased textiles but did not use them for apparel. Table 4.1 explains the states where the participants lived. Participants ranged from designers to owners of small apparel brands. Three participants participated in audio-recorded interviews. The rest of the participants completed questions via email.

The responses of the two types of participants (designers and small apparel brands) were compared for each interview question. Findings show that there were no differences in the motivations, knowledge, decision making and purchasing process when comparing the two. Since designers and small apparel brands had similar experiences, findings for were grouped together in this study.
### Table 4.1

**Participant Demographics**

<table>
<thead>
<tr>
<th>Participant Number</th>
<th>Region</th>
<th>State</th>
<th>Participant Type</th>
<th>Full-time Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>East</td>
<td>New York</td>
<td>Sweater brand</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>East</td>
<td>Delaware</td>
<td>Women’s sportswear brand</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>East</td>
<td>Pennsylvania</td>
<td>Designer</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>East</td>
<td>New York</td>
<td>Jacket and hoodie brand</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>East</td>
<td>New York</td>
<td>Women’s sleepwear brand men’s and women’s denim brand</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>East</td>
<td>New York</td>
<td>Women’s activewear brand</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>East</td>
<td>New York</td>
<td>Women’s sportswear brand</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>West</td>
<td>California</td>
<td>Athleisure apparel brand</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>West</td>
<td>Oregon</td>
<td>T-shirt brand</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>West</td>
<td>California</td>
<td>Shirts and pants brand</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>West</td>
<td>California</td>
<td>Designer dresses, tops, and leggings</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>West</td>
<td>Arizona</td>
<td>Women’s activewear brand</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Midwes</td>
<td>Minnesota</td>
<td>Suit and dress designer</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>South</td>
<td>Texas</td>
<td>Designer coat, shirt, pant</td>
<td>1</td>
</tr>
</tbody>
</table>

**Major Themes**

During the first cycle analysis, the data were analyzed using a provisional coding method (Saldaña, 2016). Provisional coding establishes a predetermined start list of codes prior to fieldwork (Saldaña, 2016 p. 168). The provisional list of codes (i.e., knowledge, persuasion, decision, implementation, and confirmation) was based on the diffusion of innovation-decision process (Rogers, 2003). During the second cycle analysis, the data were analyzed using a structural coding method for subthemes to enrich the data analysis further. Structural coding is question-based coding that “acts as a labeling and indexing device, allowing researchers to quickly access data likely to be relevant to a particular analysis from a larger data set” (Saldaña, 2016). The second cycle analysis was based off of the interview questions (Appendix D). The interview questions correlated to the perceived attributes
related to selection and purchase of sustainable textiles included: complexity, trialability, relative advantage, and observability. Each attribute is listed within the corresponding subtheme (Table 4.2). Each major theme and the corresponding subthemes are listed (Table 4.2). Each theme and subtheme are explained in the Findings section. Citation of participants were assigned an alias name to protect confidentiality and indicated as P1, P2, P3 . . . P15 to represent Participants 1 to 15. The descriptive coding method was used to analyze sub-subthemes. The descriptive coding method summarizes in a word or short phrase the basic topic of a passage of qualitative data (Saldaña, 2016).

**Table 4.2**

**Themes and Subthemes Based on DOI Decision-Process Model Stages**

<table>
<thead>
<tr>
<th>Themes</th>
<th>Subthemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Exposure to sustainable textiles</td>
</tr>
<tr>
<td></td>
<td>Defining sustainable textiles</td>
</tr>
<tr>
<td></td>
<td>Names of sustainable textiles</td>
</tr>
<tr>
<td>Persuasion</td>
<td>Seeking information (complexity)</td>
</tr>
<tr>
<td></td>
<td>Obtaining samples (trialability)</td>
</tr>
<tr>
<td></td>
<td>Minimums for purchasing</td>
</tr>
<tr>
<td></td>
<td>Favorable attitude (relative advantage)</td>
</tr>
<tr>
<td>Decision</td>
<td>Process for purchasing</td>
</tr>
<tr>
<td></td>
<td>Sustainable textiles purchased</td>
</tr>
<tr>
<td></td>
<td>Sustainable textiles desired, but not purchased</td>
</tr>
<tr>
<td>Implementation</td>
<td>Apparel items made from sustainable textiles purchased</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Advantages to purchasing (observability)</td>
</tr>
<tr>
<td></td>
<td>Disadvantages to purchasing (observability)</td>
</tr>
<tr>
<td></td>
<td>Recommendations for sourcing</td>
</tr>
<tr>
<td></td>
<td>Should brands only use sustainable textiles</td>
</tr>
<tr>
<td></td>
<td>Need for more practical information</td>
</tr>
</tbody>
</table>

**Findings**

**Research Question 1: Knowledge: How do designers and small apparel brands in the United States that have purchased sustainable textiles; describe the concept of sustainable textiles?**
Exposure to sustainable textiles

Participants were asked to describe how they were first exposed to the concept of sustainable textiles. The responses were analyzed using the descriptive coding method to summarize the topics and group them into five sub-subthemes based on these answers, which included: (a) research, (b) industry, (c) lifestyle, (d) college, and (e) not sure. Most participants responded with more than one sub-subtheme.

**Research.** Of the 14 participants, 10 responded that they were first exposed to the concept of sustainable textiles through research. Research included online, books, magazines, conferences and associations, as demonstrated by these quotes: “Books, conference, research” (P5), “Reading Fashion Fibers” (P6), “Online research” (P7), “CDFA’s official guide on sustainable strategies” (P11), and “Researching my favorite brands online” (P12). Another participant stated:

I was wondering what polyester was because I realized all of my clothing is made from it and I learned that it is essentially plastic, so I wanted to know what else was out there that was more environmentally friendly and less chemical-dependent. (P14)

**Industry.** Five participants were exposed to the concept of sustainable textiles through the fashion industry from people who worked in industry, large companies that marketed based on the concept (e.g. Patagonia), and working at companies that used textiles made from sustainable textiles as demonstrated in these quotes: “Stella McCartney, that would be the first brand that I liked that had something to do with sustainability” (P1), “Continued communication with people in industry” (P6), “Self-promotion from large companies (Patagonia) that try and market themselves based on their materials” (P9), and “In
the industry at the companies that I have worked at over 20 years” (P13). Also, this quote, which exemplified the interaction between the themes of research and industry:

I was first exposed to sustainable textiles on a sourcing trip in Hong Kong, where I found an organic cotton shirting fabric that I liked. I then started doing research and realized the negative impact that conventional textiles have on the planet, so I began changing the way I source. (P15)

**Lifestyle.** Three participants mentioned that sustainability was part of their lifestyle. They were raised in a certain way or they became more conscious growing up. This quote is an example of this sub-subtheme:

I have always been an environmentalist. At three years old, I was holding protest signs to protect the local waterways. For me it has always been a priority, my wife and I transitioned to a vegan diet, we live small we try to minimize our impact, we use renewable energy, we do offset, we plant a bunch of stuff. For me it is innate. It is based on the environment that you grow up in, and you live in. (P3)

**College.** Two participants learned about it in college.

**Not Sure.** Two participants were not sure of how they were exposed to the concept.

**Defining sustainable textiles**

Participants were asked to define sustainable textiles. These responses were subdivided into four sub-subthemes: (a) environmental impact, (b) social impact, (c) difficult to define, and (d) durability. The majority of responses combined information from one or more categories. Environmental impact was the most used sub-subtheme when defining sustainable textiles, second was social impact, third was challenging the concept, and last was lifespan.
**Environmental impact.** All 14 participants had definitions that focused on nature and environmental impact (little to no harm to the environment). Environmental impact included responses with topics such as: (a) specific fibers types (e.g., natural fibers, organic fibers, regenerated fibers, recycled fibers-natural and manufactured, no synthetics due to being non-biodegradable and releasing microfibers), (b) chemicals (e.g., no pesticides and herbicides to the soil, nontoxic chemicals, nontoxic dyes, low-impact dyes), (c) production (e.g., closed-looped production/circular, non-new materials, replants trees if using pulp), (d) water (e.g., low water consumption, non-contaminated water), (e) energy (e.g., low energy consumption, uses renewable energy), (f) carbon (e.g., replants trees to offset carbon emissions, reduced carbon footprint, domestic production) and (g) waste (e.g., biodegradable, no landfill waste, repurposing existing materials, sourced second-hand). Some of the responses that supported this sub-subtheme included, “This is the definition I find to be the most accurate: Sustainable means using methods, systems, and materials that won’t deplete resources or harm natural cycles” (Rosenbaum, 1993) (P15). Another participant stated:

No degradation of environments, no waste, and you can maintain the status quo.

Even better the term regenerative, if we can create fashion that actually puts resources back into the cycle of production, improve the environment instead of maintain the environment, then we are in a much better situation to be able to turn around the path that we are on. (P3)

**Social impact.** Of the 14 participants who responded with environmental impact, 10 also included social impact (little to no harm to people) in their definition for sustainable textiles. Social impact included responses with topics such as (a) domestic production,
fair trade, (c) human health (air and water), (d) fair wages, and (e) safe working conditions. For example, here is a response that included both environmental and social impact:

Natural materials grown/made sustainably . . . Manufactured fibers-close-loop production, processed with green chemicals. Synthetic fibers made from recycled materials-no new materials are used. Dyes/coloring and chemicals used are all low impact with green chemistry, reduced water consumption, etc.; I also consider the social responsibility in the production as part of sustainability of the textiles. Care for human health, fair wages, etc. (P4)

**Difficult to define.** P3 and P9 found it challenging to define sustainable textiles. P9 stated, “Sustainable textiles can mean many different things to different people. So, I think it is hard to find consistent information. There isn’t just one form of sustainability. It is a spectrum.” Another participant explained why it was difficult to define in this quote:

No degradation of environments, no waste, and you can maintain the status quo. Even better the term regenerative, if we can create fashion that actually puts resources back into the cycle of production, improve the environment instead of maintain the environment, then we are in a much better situation to be able to turn around the path that we are on. What is sustainable? What we do is still not sustainable, but we are on a path to sustainability. It is a growing process. Even if it is recycled, it is still not sustainable long-term, and some of the transports and distribution associated with these goods is not sustainable. But if you really want to have something sustainable, you would end up with a garment that is priced such that it is really hard to bring it to market and if you can’t bring it to market and then you can’t sell it then you can’t make any positive impact. So, you have to strike a balance between how do I make it better
than the majority of the stuff out there but still keep it at a price point that is acceptable to your audience. (P3)

**Durability.** Only P8 included durability as part of the definition: “Is the textile durable so that it can withstand many wears?”

Names of sustainable textiles

When participants were asked to name sustainable textiles, the sub-subthemes included: (a) natural fibers, (b) manufactured regenerated cellulose fibers, and (c) manufactured synthetic fibers. The majority of sustainable fibers listed were natural fibers with 12 different names listed; second was manufactured cellulose fibers with 5 different names listed, and last was manufactured synthetic fibers with 1 fiber name listed. Table 4.3 shows the different fiber names that were listed. Chart 4.1 shows the names of sustainable textiles listed with the participant numbers that listed the fiber names. Organic cotton was the most listed fiber by 10 participants. Recycled polyester was the second most listed fiber by seven participants.

Overall, participants gave in-depth information when describing their knowledge about sustainable textiles. Even though participants were exposed to sustainable textiles in many ways, the majority of participants were introduced through research. Within the variety of responses for defining sustainable textiles, the majority of the participants defined the concept as fibers that did not harm the environment or people. There was an extensive range of fiber names listed as sustainable textiles. Organic cotton and recycled polyester were the most-named fibers. The participants shared much information about their knowledge of sustainable textiles.
Table 4.3

Names of Sustainable Textiles Identified by Participants

<table>
<thead>
<tr>
<th>Sustainable Textiles</th>
<th>Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural fibers</strong></td>
<td></td>
</tr>
<tr>
<td>Organic cotton</td>
<td>P3, P4, P5, P8, P9, P10, P12, P13, P14, P15</td>
</tr>
<tr>
<td>Better cotton</td>
<td>P4</td>
</tr>
<tr>
<td>Hemp</td>
<td>P5, P9, P15</td>
</tr>
<tr>
<td>Linen</td>
<td>P8, P10, P12, P13, P14, P15</td>
</tr>
<tr>
<td>Organic linen</td>
<td>P8</td>
</tr>
<tr>
<td>Wool</td>
<td>P8, P10, P12, P14</td>
</tr>
<tr>
<td>Recycled wool</td>
<td>P5, P9, P12</td>
</tr>
<tr>
<td>Silk</td>
<td></td>
</tr>
<tr>
<td>Deadstock silk</td>
<td>P7</td>
</tr>
<tr>
<td>Peace silk</td>
<td>P4, P5, P15</td>
</tr>
<tr>
<td><strong>Manufactured regenerated cellulose fibers</strong></td>
<td></td>
</tr>
<tr>
<td>Rayon</td>
<td>P12</td>
</tr>
<tr>
<td>Rayon (or viscose)</td>
<td>P8</td>
</tr>
<tr>
<td>Rayon (or viscose)- bamboo</td>
<td>P12, P13</td>
</tr>
<tr>
<td>Rayon (or viscose) -cupro</td>
<td>P8</td>
</tr>
<tr>
<td>Lyocell</td>
<td>P3, P8, P10, P14</td>
</tr>
<tr>
<td>Modal</td>
<td>P3, P12, P14</td>
</tr>
<tr>
<td><strong>Manufactured synthetic fibers</strong></td>
<td></td>
</tr>
<tr>
<td>Recycled polyester</td>
<td>P3, P4, P9, P10, P12, P13, P15</td>
</tr>
<tr>
<td><strong>Other fibers listed (leather alternatives)</strong></td>
<td></td>
</tr>
<tr>
<td>Cork</td>
<td>P8</td>
</tr>
<tr>
<td>Leather made from food waste</td>
<td>P4, P8, P14</td>
</tr>
<tr>
<td>Leather made from fish</td>
<td>P14</td>
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Research Question 2: Persuasion: What persuaded these designers and small apparel brands to form a favorable attitude toward sustainable textiles?

Seeking information (complexity)

To understand the complexity of purchasing sustainable textiles, participants were asked if it was easy to find information about sustainable textiles. Of the 14 participants, 10 answered, “No, it is not easy,” two participants answered, “Yes, it is easy” and two participants answered, Yes and no, depending on the information. Each participant explained why it was or was not easy to find information about sustainable textiles. The explanations for why seeking information was not easy were grouped into three sub-subthemes: (a) lack of consistent information on the meaning of sustainability, (b) lack of information on sustainable textiles, and (c) lack of information from suppliers. The explanations for why seeking information was easy were grouped into a sub-subtheme called easier now, than in the past.
Lack of consistent information on the meaning of sustainability. Due to sustainability being such a broad term and having various meanings, participants mentioned understanding all forms and aspects of sustainability. Some participants mentioned that seeking information on sustainable textiles was not easy due to the multiple meanings of sustainability. P9 stated, “No. Sustainable textiles can mean many different things to different people. So, I think it is hard to find consistent information. There isn’t just one form of sustainability. It is a spectrum.” P6 stated, “Once you know what aspect of sustainability you want to focus on, yes it’s easy. But getting there is not easy.”

Lack of information on sustainable textiles. Finding information on types of sustainable textiles can be a challenge due to the in-depth research process of learning the impacts of each fiber related to sustainability. Many participants mentioned that seeking information on textiles was not easy due to the extensive research process involved. P3 mentioned, “It requires you to do a lot of research and question everything that is being presented to you and ask very challenging questions to the producers of these goods.” Two other participants gave descriptions of their process:

It’s a long process from the time I find the fabric to point of using it in my collection because I have to do so much research into the textiles. But I love searching for and developing new materials; it’s my favorite part of the process. Finding sustainability information on each fabric is a little trickier than finding fabrics I love. It involves doing research, my due diligence, and asking a lot of questions. (P15)

It is just really not easy . . . I first found fabric that was similar, I looked at it, and I loved it, but it was synthetic . . . I tried to look for a better-quality version if there was anything that existed. That took me all through many, many different avenues of
going deep into finding . . . then I went through a lot of trial and error with the fabric, and I just recently got it nailed. But it took a long time. (P1)

**Lack of information from suppliers.** Finding information on where to get sustainable textiles, as well as verifying the textile production method, was a challenge. Participants mentioned that seeking information on sustainable textiles was not easy due to lack of sourcing information and transparency with textile manufacturers. Some textile mills have a minimum order quantity (MOQ) requirement, which is the lowest textile yardage/meter amount required in order to purchase. This amount is typically specified by the supplier. P12 mentioned, “Finding sources is not easy because sourcing is an important part of a brands competitive edge and can lead to other brands stealing or replicating easily if revealed.” Another participant explained the difficulty based on supply and demand and then the lack of trust. This participant suggested investing in a third-party certification to verify the claims made by the supplier:

No, it is not easy. Number one, demand is low, so supply is low, and cost is high. Number two, lack of transparency, how would you know if the claim is real or greenwashing if the supplier needs a third-party certification for their claim—becomes more expensive (P4)?

Another participant expressed frustration with working with the textile companies that have high minimum order quantities; it was vital to continue looking for companies with lower minimums:

No. Many companies don’t have websites; if they do, they do not allow you to order from them. Instead, you have to contact them for further information . . . Most of the time, they don’t get back to you. Go to the trade show and even though they have
fabrics you like, you may not be able to buy their MOQ, which can be 1,000 meters. Many of the newer companies... will sell to big companies long before smaller designers who actually support innovation will be able to purchase anything. (P8)

Tracking every step in the production process is a challenge but extremely rewarding when done. Designers and small apparel brands need to take the time and resources to learn how and where the product is made, starting with the raw materials:

No, because not only both you and the manufacturer have to be completely transparent and honest, you both have to well-versed in exactly what it takes to be sustainable and how you define it. Exactly where it came from and what is every step from production to finish. (P11)

All of these barriers presented challenges when trying to purchase and could easily discourage designers and small apparel brands from purchasing, but these designers and small apparel brands were determined to work around these barriers.

*Easier now, than in the past.* Participants mentioned that it was easier now than in the past due to more information being available online and at tradeshows, but it was still not easy (P3, P5, P14, and P15). A few participants disagreed with most and responded that it was easy to find information on sustainable textiles. Here is what these participants had to say, “It is easy to find when I put time into research” (P7), “Information is very easy to find because sustainability is clearly used as a marketing point” (P10), and “Yes, there is much more information online and at trade shows about sustainability than in years past. It’s getting easier and easier, but most of the places I’ve gotten the most valuable information is from paid classes or programs” (P13).
Obtaining samples (trialability)

To understand trialability, participants were asked whether they saw a sample of the sustainable textiles, and if so, how. Of the 14 participants, 13 saw samples before purchasing, and one did not. P7 was the only participant who did not see samples because textiles were purchased as deadstock (textile stock that was left over after production run) and second-hand fabric. When asked how they ordered samples, some participants who got propriety fabrics produced, purchased yarns and then got them woven or knitted to see samples made from the yarns (P1, P3, and P8). The other participants ordered swatches online, at trade shows, through fabric suppliers, directly from mills, or in stores (P4, P5, P6, P8, P9, P10, P11, P12, P13, P14, and P15).

Minimums for purchasing

When asked what the minimums were when purchasing the sustainable textiles, responses were grouped into sub-subthemes, which included no minimums (P5, P6, P7, and P10), 10-1000 meters/yards (P4, P8, P11, P12, P13, P14, and P15), and larger than 1000 meters/yards (P1 and P3). P3 explained the minimums for purchasing larger than 1000 meters/yards, “Minimums for producing fabrics-yarn quantities is calculated by weight and I can’t remember. Minimum for knitting and for dyeing and finishing that is about 3,000 yards, which is about 3,300 garments minimum.” Overall, the majority responded with minimums between 10-1000 meter/yards. For example, P8 explained, “The minimums can be anywhere between 50-1,000 meters/yards + shipping and customs.”

Favorable attitude (relative advantage)

To understand the relative advantage, participants were asked when they formed a favorable attitude toward the sustainable textile and decided it was better than other textiles.
The responses were categorized into sub-subthemes that included: after learning specifics about the fashion industry, after working in the industry, after viewing the sample, and always attracted to natural fibers. Overall, most participants formed a favorable attitude toward sustainable textiles.

**After learning specifics about the fashion industry.** Six participants formed a favorable attitude toward sustainable textiles after learning about the issues caused by the fashion industry. The responses included, “About 15 years ago. after I learn how the textile industry caused the environmental problems” (P5), “Probably in the mid-80s when a lot of environmental issues were starting to be talked about, and products like organic cotton were starting to be introduced” (P8), “When I realized how much damage other textiles are doing to nature, doesn’t matter how cheap they cost” (P11), “Day one, I have always been a conscious consumer but the rise in fast fashion has made it more of a focus to become as sustainable as possible no matter the cost” (P12), “I was concerned we were putting so much plastic on our skin in the form of clothing” (P14), and “I then started doing research and realized the negative impact that conventional textiles have on the planet, so I began changing the way I source” (P15).

**After working in the fashion industry.** Three participants formed a favorable attitude toward sustainable textiles after working in the industry. P7 responded, “I worked in vintage sourcing and found the amount of textile waste to be undeniable. When I started my business, I knew I had to find ways to contribute to the waste stream as little as possible.” Other participants responded:

Three years ago. I thought about how many items the company I worked for was producing and could not wrap my mind around where all this is coming from and
how it’s being made. As I learned more, I realized there are viable options, and they don’t have to be luxury. (P6)

I started my career working in the denim industry, then worked for larger fast fashion brands in Montreal and New York. In 2009, I left my last job designing a high street brand . . . I started this brand at a time in my career when I was very frustrated with fast fashion and mass production. (P15)

_After viewing the sample._ Two participants formed a favorable attitude toward the sustainable textiles after viewing the custom-made sample. These participants mentioned that they had to develop fabrics that did not exist. They knew the quality and hand but could not find fabrics produced in the fibers that they wanted. These participants worked with textile manufacturers to get the correct blend of fibers to produce the yarns and the fabric. Once the final samples were made, and they matched the fiber content, quality, and hand desired was when the participants formed a favorable attitude toward the textile:

The fabric that we created is a proprietary blend; it did not exist. Tri-blend fabrics have been around for a couple decades, and so they are typically 50% polyester and some mix of rayon and cotton. We knew that we liked the characteristics of the tri-blend we just wanted to create a more sustainable alternative. (P3)

I’ve always loved cashmere, but found it too hot and sticky and precious to withstand the elements at the beach . . . finding Lenzing Modal, which is highest level of beech wood fabric and they do everything. Their process is exceptional. That led me there, and then I went through a lot of trial and error with the fabric, and I just recently got it nailed. . . . It’s a natural rejuvenation, and when it’s turned into yarn and fabric, there are no chemicals in it. It’s really natural. It is also much cheaper than cashmere. (P1)
Always attracted to natural fibers. One participant formed a favorable attitude toward sustainable textiles due to a preexisting attraction to natural fibers, “I have always been attracted to the most common natural fiber textiles because they have a history of being a more luxurious product” (P10).

To summarize the findings in persuasion, most participants believed it was difficult to seek information on sustainable textiles for many reasons. Once the textiles were found, most of them were able to obtain samples of the textiles from the suppliers. Based on the majority of responses, suppliers typically had a MOQ range from 10-1000 yards. All participants had a favorable attitude toward sustainable textiles, mostly due to them reducing negative impacts on the environment.

Research Question 3: Decision: What activities led to the choice to purchase sustainable textiles?

Process for purchasing

Participants were asked to explain the process of purchasing sustainable textiles. The responses were grouped into sub-subthemes that included: (a) textile mills, (b) online, (c) trade show, (d) converter and (e) community network.

Textile mills. Five participants mentioned that after extensive research they purchased sustainable textiles directly from the supplier by sending in a purchase order. Some mentioned, “Purchased through our overseas factories or directly to fabric mills” (P13), “called them, and sent a purchase order” (P14). Two participants purchased raw fibers then had yarns produced and contracted a textile mill to produce fabric according to their specifications. P1 and P3 explained their process for purchasing from textile manufacturers:
That took me all through many, many different avenues of going deep into finding Lenzing Modal, which that is highest level of beech wood fabric and they do everything. Their process is exceptional. Fibers are purchased, and then a local mill makes the yarn and the knits the fabric. (P1)

The fabric that we created is a proprietary blend; it did not exist. We knew that we liked the characteristics of the tri-blend . . . we ended up finding a cotton cooperative in Texas that grows certified organic cotton…we settled for one that had the best recognition in the market place made in Unify in North Carolina called RePreve . . . We settled on modal because it is definitely a better alternative and we sourced that from a company in Austria which is setting the bar on sustainable harvesting and processing of the cellulose itself. It is Lenzing—I visited the production facility-closed-loop cycles. Overall, they are doing the best job. They produce the lowest impact of that modal in the market place. It is spun by a company in the United States called Spunlab, and we worked with a company called Carolina Cotton Works to get it knitted dyed and finished. When we got the first samples, we knew that we were on to something; it’s a high-quality shirt compared to most other options in the industry, it is more sustainably sourced. (P3)

**Online.** Five participants mentioned purchasing sustainable fabrics online (P4, P5, P8, P12, and P15).

**Trade shows.** Three participants mentioned purchasing sustainable textiles at tradeshows, “I’ve been to several trade shows and have received some samples from those but the minimums plus shipping and customs is always too high” (P8), “Magic Sourcing Show, Active-Collective trade show” (P12) and “I visit fabric shows” (P15).
Converter. P6 mentioned purchasing directly from the converter (the company that converts sweaters to yarn to be knit again).

Community networks. P7 purchased sustainable textiles such as deadstock silk, linen, and wool from other people through Craigslist, Facebook, and yard sales.

Sustainable textiles purchased

Participants were asked to list the sustainable textiles that they had purchased. The textiles listed were categorized into sub-subthemes that included: (a) natural fibers, (b) manufactured regenerate cellulose fibers, (c) manufactured synthetic fibers and (d) proprietary blended fabrics.

Natural fibers. The natural fibers purchased were: deadstock cotton (P7), organic cotton (P3, P5, P9, P13, and P15), GOTS-certified organic cotton (P4), upcycled cotton yarn (P6), hemp (P5, P9, P12, and P15), deadstock linen (P7), organic linen (P4), linen (P15), ramie (P8), peace silk (P5, P8, and P15), deadstock silk (P7), recycled wool (P5, P9), and wool (P8). Overall, organic cotton was the most purchased natural fiber.

Manufactured regenerated cellulose fibers. The manufactured regenerated cellulose fibers purchased were “cupro” (P8), “viscose bamboo” (P9 and P12), “lyocell” (P8 and P14) and “modal” (P1, P3, and P12). Overall, modal was the most purchased manufactured regenerated cellulose fiber.

Manufactured synthetic fibers. The manufactured synthetic fibers purchased were “recycled polyester” (P3, P9, and P15). Overall, recycled polyester was the only purchased manufactured synthetic fiber.
Figure 4.2. Sustainable textiles purchased by fiber category.

Sustainable textiles desired but not purchased

When participants were asked if there were any sustainable textiles that they wanted to purchase but could not find where to purchase, 9 participants responded “No” (P1, P3, P6, P9, P10, P12, P13, P14, and P15), and 5 participants responded “Yes” (P4, P5, P7, P8, and P11). The majority of participants answered no. If the participants answered yes, they were asked what fabrics they desired but could not determine where to purchase; the response was “It is always hard to find. At this time, I choose the strategy to what is available and make selections from that” (P4). “Recently, some vegan leathers (like Pinatex) available but not really available for an individual” (P5), “I hope to work with post-consumer recycled denim” (P7), “I want beautiful heavyweight crepe, faille, and satin that have the luster and body of silk and are made with low-impact dyes with low minimums” (P8) and “Yes, I want to purchase waterproof fleece made out of 100% recycled used plastic bottles” (P11).

Overall, the process for purchasing was conducted in multiple ways. Most participants purchased directly from textile mills and online. Natural fibers were the most purchased sustainable textile category with organic cotton as the most purchased fiber type. When asked if there were any sustainable textiles desired but not purchased, the majority
responded no. Once participants found the information to purchase, the process for purchasing seemed straightforward to get most of the desired textiles.

**Research Question 4: Implementation: How do designers and small apparel brands put sustainable textiles to use?**

**Apparel items made from sustainable textiles purchased**

When asked what apparel items were made from sustainable textiles purchased, 14 participants had made apparel items with the sustainable textiles purchased. The one participant who did not make apparel items was a fabric retailer who sold sustainable textiles to consumers. The participants had a range of merchandise categories such as “Men’s and women’s athleisure sportswear” (P3 and P8), “Women’s activewear/yoga pants” (P12 and P14), “Women’s sleepwear” (P13) and “Men’s and women’s denim” (P13). The apparel items listed were “t-shirts” (P3), tops (P3, P5, P10, P14, and P15), “shirts” (P3, 7, and 15), “sweaters” (P3, 6, and P15), hoodies (P11), jackets (P3, P11, and P15), coats (P5), “pants” (P3, P4, P5, P7, P8, and P15), “leggings” (P10, P12, and P14), “shorts” (P14 and P15), “sports bras” (P14) “skirts” (P3, 8, and 15), “dresses” (P3, P4, P5, P8, and P15) and “suits” (P4 and P15). Overall, a variety of items were made from the sustainable textiles listed, but pants seemed to be the most made item.

**Research Question 5: Confirmation: What reinforcements do designers, and small apparel brands have after purchasing sustainable textiles?**

**Advantages of purchasing**

When participants were asked what the advantages of purchasing these fibers were, the sub-subthemes included: (a) low impact on the environment/people and (b) quality.
**Low impact on the environment/people.** Eleven participants primarily purchased these textiles to promote responsible behavior by using renewable resources, reducing waste, lowering the carbon footprint, reducing water waste, and lowering toxic chemicals. Three examples of this sub-subtheme were mentioned in these responses, “You are behaving responsibly, and you are doing something positive for the environment and society” (P3), “Not creating waste of water and emissions from cotton crops and cotton processing” (P6), and “Plastic-free, less water usage than cotton” (P14).

**Quality.** Five participants (P1, P3, P7, P10, and P12) purchased sustainable textiles for the quality, which was seen as equal to, or better than, non-sustainable fabrics. For example, P3 stated, “They have recognized that it did not degrade the quality in any way, but in fact, made it better that for the marginal incremental cost that everyone is better off” and P10 stated, “The natural textiles each have their own identifiable attributes, that are preferred by consumers such as the drape of the textile and the breathability.”

Disadvantage of purchasing of sustainable textiles

When participants were asked what the disadvantages to purchasing sustainable textiles were, several sub-subthemes emerged: cost, sourcing, limited variety/color, lead times, traceability, perceptions, lack of understanding, lack of awareness, educating yourself, low demand from consumers, minimums, time-consuming, and inefficient. Most responses related to more than one of these sub-subthemes. One participant stated, “Typically they are more expensive, and color choices/suppliers are limited” (P12). Other responses supported this subtheme by explaining:

Financially there is not positive-it cost more to manufacture, and the market will tolerate a little bit more of a premium but not as much as the incremental cost you
incur so your margins are degraded. It’s harder to source; you have longer lead times; there is a lot of incremental education that you need to do in order to effectively bring it to the market. Even though market perception and customer demand are changing, it is still really early on—it is not a “shoe in” you are taking on a challenge. (P3) Perception is that conventional cotton is the only option and that if you go organic the quality goes down and there is no good use for it. Recycled polyester has the same perception. I demanded that we use organic cotton and recycled polyester, and the look on people’s faces was somewhat concerning, but people come around. It was a lack of understanding, and it’s a lack of awareness, and now this company is our biggest supporter. (P3)

None for the earth. For me personally, its taken years to put this collection together, and it still feels far from perfect as far as materials are concerned. It’s time-consuming, inefficient, and expensive. I can see why most people either give up or just buy boring, organic cotton jersey knits because that sort of thing is the only kind of “sustainable” fabric that’s widely available. Most people aren’t as stubborn as I am. (P8)

Recommendations for sourcing sustainable textiles

Participants recommended a list of places to purchase sustainable textiles. These were grouped into sub-subcategories that included: (a) trade shows, (b) online, (c) textile mills, and (d) other resources (Table 4.4). Two participants gave advice on researching:

You have to dig in and find this information it wasn’t readily available for us the blends that we wanted were not available we had to create it ourselves and hopefully that changes—in our space, which are knitted fabrics, there are some companies
starting to make available bolts of fabrics that smaller companies can purchase and make their own goods and all of that will help make it more available. (P3)

The best advice I can offer is to do your research, ask a lot of questions, and make sure you’re fully informed. Unfortunately, there’s a lot of greenwashing in the textile industry as a result of a growing need for sustainability. If the textile isn’t certified by recognized body (GOTS, BlueSign, etc.), then it’s important to visit the mills if you can or make sure that the textiles are being made the way they are claimed. (P15)

Table 4.4

Recommendations for Sourcing Sustainable Textiles

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<thead>
<tr>
<th>Resource Type</th>
<th>Resource</th>
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<tbody>
<tr>
<td>Trade Shows</td>
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<td>Fabric Expo Show</td>
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<td>Sourcing at Magic</td>
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<td>Queen of Raw</td>
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<td>Textile Mills</td>
<td>Jobbers</td>
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<td>Deadstock suppliers</td>
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<td>Smaller vertically integrated agencies</td>
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<td></td>
<td>Local fabric mills</td>
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<td></td>
<td>Visit mills directly</td>
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<td>Other Resources</td>
<td>Deadstock District</td>
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<td>Fabscrap</td>
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<td>Roadmap</td>
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<td>CFDA Sustainability Resources</td>
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<td>Textile Magazine</td>
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<td>Textile associations and groups</td>
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Should brands only use sustainable textiles?

Participants were asked if they thought that people should only use sustainable textiles when making apparel. Of the 14 participants, 13 responded yes, and 1 responded no. Participants who responded yes made the following comments:

Yes, because the alternative is incredibly exploitative of the environment and our own civilization that are involved in the making of these goods. . . . Thing like slave labor, exploitation of resources, or economic or poverty orphans all of that is real and still very persuasive in this industry. The textile industry is most guilty of these things. Then there is the use of chemicals, pesticides, insecticides, herbicides. The quantity per t-shirt is staggering, like a third of a pound of chemicals to make one single t-shirt. Wasteful water consumption is 700 gallons of water to make one single t-shirt, enough to . . . for three years. When you start going into those statistics, it is mind-boggling, and when you share that with people potential consumers, there is very little awareness about it. So, once you start sharing that and making people aware and have passion about it, it is really easy to convince people to purchase these better options. Without that information, what is generally what is all bad stuff, and we don’t even recognize it and were not even aware of it. (P3)

Yes, If the offset of carbon footprint is larger when purchasing sustainable fabrics versus purchasing non-sustainable fabrics then yes however, there are many instances, that most people don’t realize, when purchasing a fabric of lesser quality that expires faster and ends up in a landfill quicker is actually a lesser carbon footprint than that of the process and materials required to manufacture sustainable fabrics. You must factor in all aspects and not just the beginning or end result. For
example, if the sustainable fabric I am ordering comes from across the world and it requires an insane amount of fossil fuels and energy to get it to be versus the unsustainable fabric I can buy next door, then chances are, when it is all said and done the so-called “sustainable fabric” may actually leave a larger carbon footprint. (P12)

Yes, fashion uses way too many resources and toxic ingredients that are harming our health and the health of the planet—we need everyone to do their part in fixing this. (P14)

Yes, I see the sustainable design industry becoming more mainstream. As young design students learn about the importance of ethical and sustainable design, I believe they will bring this belief into their jobs, and future careers and slowly sustainable choices will begin to trickle upward from them. That’s why I believe education is key to the future of sustainability. (P15)

The participant who said no, mentioned:

No. I agree that the industry as a whole should be more aware and provide outlets for consumers to purchase sustainable textiles, but there are so many factors that need to change for the industry to be fully providing sustainable materials for consumers to buy. (P13)

**Need for practical information concerning sustainable textiles**

Participants were asked if it would be beneficial for people to have a tool that explained a clear definition of environmentally sustainable textiles with a list of fiber names and places to purchase them. Responses were grouped into sub-subthemes that included: yes, it would be helpful, build on existing resources, fair trade and organic labels, a network
of maker/sellers/buyers, and blockchain to track products. Overall, the majority of participants thought resources or tools would be beneficial.

**Yes, it would be helpful.** Seven respondents thought it would be helpful to have a clear definition of sustainable textiles and a list of sustainable textiles:

Yes, to part one, clear definition. When I started, I was looking for something like this. But since it was not available, it forced me to talk with peers and really understand what sustainability means and what aspect is most important to me. I think since there is no perfect sustainable material, it’s not as simple as checking out a directory and picking the right supplier, at least not yet. I think it’s more important to know how your materials are sustainable, but also how they are not sustainable. That only comes about with conversations. (P6)

Most designers aren’t running giant corporations so we really need mills and factories that will work at a more human scale and we need to find ways to subsidize companies that are willing to make the leap into a more sustainable model. (P8)

**Build on existing resources.** Participants wanted to build on resources such as, “The Fashion Designers Sustainable Sourcebook” (P4), “The CFDA has a resource directory on their site, but it’s not super easy to find and they have many things listed that aren’t even in production yet so it’s not what I’d call useful” (P8), and another participant agreed “CDFA’s official guide on sustainable strategies” (P11).

**Fair trade and organic labels.** Other participants felt the need for a labeling system to identify sustainable textiles from unknown brands. One participant mentioned, “I think a labeling system the way the FDA organic seal works would be a good place to start” (P14). Another participant agreed:
Yes, there is a couple of initiative that are trying to do it. Right now, you do it based on brands that you trust to do the right thing. It would be nice if there was some fair-trade label or organic label, so that identifies it to cross brands and I don’t have to limit myself to shopping at those places. (P3)

**Network of maker/sellers/buyers.** Participants responded that they wanted a network of professionals focused on using sustainable textiles, with specific information for designers and small apparel brands:

Absolutely yes—I know that deadstock is not the answer to sustainable fabrics because it is part of the problem of overproduction, but it’s the best solution I could come up with now—I wish there were a network for makers/sellers/buyers of sustainable textiles. (P7)

Most designers aren’t running giant corporations so we really need mills and factories that will work at a more human scale and we need to find ways to subsidize companies that are willing to make the leap into a more sustainable model. (P8)

**Blockchain to track products.** One participant mentioned the need for tracking products for transparency:

Of course, . . . knowledge is power, and we hope to see the concept of blockchain being implemented in fashion production in the future, allowing us to track every part of a product from its beginning, so we know exactly how much it cost and what went into its completion. (P12)

**Discussion**

The purpose of this study was to explore what, why, and how designers and small apparel brands in the United States purchased textiles comprised of sustainable textiles.
Findings show that knowledge and relative advantage positively influenced adoption/purchasing. Related to themes based on DOI decision-process model, factors that negatively influenced the decision to adopt or purchase were complexity, trialability, and observability. These findings answered the following research questions: (1) In the United States, what do designers and small apparel brands know and understand about the concept of sustainable textiles? (2) How are they persuaded to purchase sustainable textiles? (3) Why did they choose to adopt/purchase sustainable textiles? (4) How are they using sustainable textiles? (5) What confirmation do they have after purchasing sustainable textiles?

**Knowledge**

The findings of this study show that knowledge positively influenced designers and small apparel brands to purchase innovative, non-conventional sustainable textiles. Rogers (2003) stated, “knowledge of the existence of an innovation can create a motivation to learn about it and, ultimately, adopt it” (p. 172). Although it was not clear whether the participants were first exposed to the concept of sustainable textiles by accident, or by initiating it. However, all of the participants had acquired awareness-knowledge, how-to knowledge, and principle knowledge through independent research. This finding supports the suggestion that “designers should be able to understand the environmental issues within their own practice, even if they are not required to do so by their employers” (Sherburne, 2009) and “knowledge about sustainability of a fiber and fabrics is becoming a requirement in the fashion industry” (Gullingsrud, 2017, p. xiv). This means that designers and small apparel brands need awareness-knowledge as early as possible. The literature calls for educational institutions as the source for this knowledge “educational establishments will be sources of “slow knowledge” and will become incubators for new business models, providing a safe place for
putting sustainability into practice quickly” (Fletcher, 2012, p. 181), and “based on the lack of sustainability-focused fashion programs or substantial coursework, fundamental issues of sustainability and practical innovation have not been fully addressed in American universities” (Palomo-Lovinski, 2014, p. 103).

In the knowledge stage, the findings reflect that designers and small apparel brands were exposed to distinct sustainability-focused problems at different times throughout their professional lives. This means that levels of awareness-knowledge “information that innovation exists” and “what is the innovation?” differed among participants (Rogers, 2003, p. 173). Some were aware of only one problem while others were aware of the magnitude of problems in the lifecycle of apparel textiles.

In the knowledge stage, time of exposure may also impact principle knowledge, which “consists of information dealing with the functioning principles underlying how an innovation works” and “Why does it work?” (Rogers, 2003 pp. 172-173). This could mean that the designer or small brand with earlier exposure was more experienced and practice understanding the principles of the concept. Designers and small apparel brands had similarities in principle knowledge of the concept. This means that they understood why it worked “minimizing harm to the environment and people,” but all said it in a different way. Gullingsrud (2017) supported this by stating, sustainability is a word often used, but not consistently defined.

Lastly, in the knowledge stage, designers and small apparel brands listed most of the same sustainable textiles as presented in the literature review. Although a few participants had questionable answers, the majority were able to name conventional fibers, as well as additional fibers not suggested in the literature such as peace silk, another name for silk that
does not come from a killed chrysalis. This means that how-to knowledge, which “consists of information necessary to use the innovation properly” and “How does it work?” was not evident among the designers and small apparel brands (Rogers, 2003, p. 172). Some small apparel brands listed most of the sustainable textiles listed in the literature but did not know how the fiber blending process affected the biodegradable or circular process of textiles. For example, one small brand mentioned using modal, which is biodegradable and has a circular process, but then explained that it had to be blended with spandex fiber, which is not circular or biodegradable. Any blended textile that uses polyester, recycled polyester, nylon, spandex, or acrylic will not biodegrade in the landfill. Blended fibers also have a lesser chance of being able to be recycled due to the mixture of fiber contents. So, even though sustainable textiles were selected in the production stage, the blending of the fibers caused the textile not to biodegrade or recycle. Therefore, the textile adds to waste accumulation. No participants listed cotton or polyester; it was all organic cotton and recycled polyester. This means that the participants understood what major fibers should not be used but might not know how they should be used.

**Persuasion**

In the persuasion stage, the findings mean that the perceived characteristics of relative advantage and compatibility had a positive influence on forming a favorable attitude toward adopting/purchasing while complexity, trialability, and observability had a negative influence on adopting/purchasing sustainable textiles. Roger (2003) listed that relative advantage sub-dimensions included, “economic profitability, low initial cost, a decrease in discomfort, social prestige, a savings of time and effort and immediacy of reward” (p. 233). In contrary, these sub-dimensions were not the same for these designers and small apparel brands.
Sustainable textiles tended to cost more, which tended to be less economically profitable, and the research process required using more time and effort. This means that designers and small apparel brands were primarily persuaded by the relative advantage of saving the planet over the relative advantage of having higher profits.

The perceived characteristics of complexity and trialability were found to have negative impacts on the decision to purchase textile composed of sustainable textiles. The findings show that high complexity was experienced when seeking information on the textiles; many participants expressed frustrations during the extensive research. Some participants had difficulty finding information on sustainable textiles that existed, while others had difficulty seeking information on textile manufacturers to produce proprietary textiles. This means that many other designers and small apparel brands may give up at this point if they do not have the patience or commitment to the cause. This finding demonstrated great need for simplifying the process of obtaining information on purchasing sustainable textiles and fabrics.

In the persuasion stage, trialability had a negative impact if the MOQ was larger than the designer and small brand needs. Most designers and small apparel brands are producing smaller quantities and do not need a large volume of textiles. Therefore, trialability is low for textiles with large minimum order quantities. This means that the textiles most purchased may have lower minimums, such as organic cotton. This also suggests that there is a need for a data base of vendors who sell textiles made from sustainable textiles, and have little to no purchase minimums, so that more designers and small apparel brands can utilize the textiles.
Decision

In the decision stage, findings show that designers and small apparel brands innovate by adopting sustainable fibers primarily to minimize harm to the environment and living things. Findings show that purchasing textiles is done mostly online and directly from mills through tradeshows. While purchasing sustainable textiles and fabrics online is convenient, there are limited options available. Tradeshows can be costly to attend but can expose a variety of sustainable textiles. This means that designers and small apparel brands need a data base of sources (e.g., online websites, tradeshows, mills) that sell sustainable textiles. Findings show designers and small apparel brands purchase the following natural fibers: GOTS-certified, organic, and upcycled cotton, organic, deadstock and regular linen, peace, and deadstock silk, recycled, and regular wool. These fibers align with the suggested fibers in the literature review, indicating that participants understand the proper natural fibers to purchase.

Natural fibers are the most purchased sustainable textiles. This may mean that natural fibers are easier to find online and do not require high minimum orders. Findings show that designers and small apparel brands also purchase the following manufactured regenerated fibers: viscose, bamboo, rayon, cupro, lyocell, and modal. Lyocell and modal are the only fibers that align with the suggestions from the literature review. This may mean that designers and small apparel brands need more clarification on manufactured regenerated cellulose fibers. Findings show that designers and small apparel brands purchase recycled polyester as the only manufactured synthetic fiber. This fiber aligns with the suggested manufactured synthetic fiber listed in the literature review. Overall, designers and small
apparel brands knew the proper fibers to purchase if they wanted more sustainable textile products.

Additionally, in the decision stage, findings showed there were still many textiles that designers and small apparel brands would like to purchase, but could not find vendors. Some of these fabrics were leathers made from food waste; post-consumer recycled denim; 100% silk crepe, faille, and satin with low-impact dyes and 100% recycled polyester waterproof fleece. This indicates a need for designers and small apparel brands to share information to aid in finding desired textiles and to meet minimum order requirements. Participant P15 explained how sharing orders helps meet minimums:

   My favorite textile in my collection at the moment is recycled pre-consumer denim from the New Denim Project in Guatemala. They divert denim waste from landfill and make new beautiful textiles from it. They usually have a 2000-yard minimum, but they also produce some inventory, so I tack on to other orders and buy available yardage from them. (P15)

**Implementation**

In the implementation stage, findings show that sustainable textiles are used in a variety of apparel items. This means that designers and small apparel brands are not limited to what is produced with the sustainable textiles. The content of all the apparel items was not mentioned. Designers and small apparel brands are creating non-blended and blended textiles with some sustainable properties. This is a problem and does not support the literature reviewed by Fletcher and Grose (2012) about blending sustainable textiles. Designers and small apparel brands may also change the variety of merchandise produced, if fibers are not blended, to allow for biodegradability and recyclability. There is a growing
need for descriptive information about blended fibers and the impact on the end-of-life stage in the textile lifecycle.

**Confirmation**

In the final stage of confirmation, findings revealed that among these participants, the few positive factors outweigh the many negative factors that influence the decision to purchase sustainable textiles. This means that saving the planet and people were the most significant perceived benefits of innovating through use of sustainable textiles, and the confirmation stage validates this value for most participants. The majority of participants agreed that apparel brands should only use sustainable textiles if possible. All expressed a need for more practical information in a variety of methods to help others purchase these textiles. This means that these designers and small apparel brands are happy with their conscious decision to purchase sustainable textiles regardless of all the challenges throughout the process.
This research was conducted to address the gap in the literature concerning the purchasing practices of designers and small apparel brands in the United States regarding sustainable textiles. The purchasing of sustainable textiles by small apparel brands can be viewed as an innovative business practice. Rogers’ (2003) diffusion of innovation (DOI)-decision process provides a framework to understand the knowledge, persuasion, decision, implementation, and confirmation of designers and small apparel brands purchasing of sustainable textiles. The innovation-decision perspective explains how and why new ideas spread, and the factors that influence purchase decisions concerning new and alternative materials such as sustainable textiles. Knowledge and relative advantage of sustainable textiles and processes were key factors that positively influenced purchasing decisions. On the contrary, the factors that negatively influenced purchasing were complexity, trialability, and observability.

Rogers’ (2003) diffusion of innovation-decision model states that there are three types of knowledge about an innovation; “awareness knowledge, how-to knowledge and principles knowledge” (p. 173). Knowledge is vital to the adoption or purchasing of sustainable textiles. For example, many scholars focused on awareness-knowledge and principles knowledge of sustainability related to textiles. Baugh (2015), Fletcher and Grose (2012), and Gullingsrud (2017) all stressed the need for integrating sustainable practices through fiber selection. All of these scholars listed the advantages and disadvantages of fibers. This research study contributes to the body of literature, providing how-to knowledge specifically for individual designers and small apparel brands in the textile and apparel
industry. This research attempts to increase awareness knowledge, principle knowledge and how-to knowledge.

The findings show that designers and small apparel brands do indeed function as change agents by integrating many different types of natural and manufactured sustainable textiles into materials selected for garment design and production. Most purchased these textiles because they strive to make an environmental and social impact by making sustainable textile selection as a priority. This research provides a resource of practical information shared by designers and small apparel brands that have integrated sustainable textiles. The findings discuss the challenges of these designers and small apparel brands when researching and sourcing and how they have overcome these challenges. Sharing this information would inspire and aid others in the fashion industry. This study contributes by broadening the scope of people who adopt sustainable textiles.

A wide variety of designers, sewers, students, and small apparel brands select textiles daily without considering the impact of their choices. It would also allow designers and small apparel brands to have a greater impact on preserving the earth’s natural resources. In conclusion, if more sustainable textiles are adopted, this research will help global sustainability by reducing water usage, chemical pollution, biodiversity, renewability, waste in landfills, negative impacts on human health, and damaging social effects on producer communities.

Practical Implications

This study shares awareness knowledge of why sustainable textiles are important and considered an innovation. Certain textiles use toxic chemicals, pollute air and water (which causes health problems and birth defects in surrounding communities); highly consume non-
renewable natural resources (e.g., water, energy, oil, land); harm animals and contribute to high waste accumulation (releasing ozone methane gasses and airborne particulates which cause asthma) ((Baugh, 2015; Fletcher & Grose, 2012; Gullingsrud, 2017). Designers may not be aware of how choosing a textile can have negative environmental, social, and economic impact, as well as the lifecycle management of the apparel item.

This study also shares principles knowledge by providing a working definition of sustainable textiles and listing sustainable textile names. The innovation is to select sustainable textiles, which are textiles that are environmentally friendly (produced, used and disposed of using methods, systems and materials that won’t deplete resources or harm natural cycles), socially responsible (persistently achieving good social well-being) and economically profitable (produce a consistent operational profit). Fibers are selected based on their ability to biodegrade (naturally breakdown and decompose) or to be renewed (technically be broken down and recycled into new material) (McDonough & Braungart, 2002). Fibers cannot be blended because it does not allow biodegradability or recyclability (Fletcher & Grose, 2012). This is innovative because it is a new approach to selecting textiles in the apparel industry that requires designers and small brands to know more information about the entire lifecycle of the textile and consider the environmental and social impacts. The textiles to select are natural fibers (GOTS-certified, organic, and upcycled cotton; organic, deadstock and regular linen; hemp; peace, and deadstock silk; recycled, and regular wool), manufactured regenerated fibers (lyocell and modal) and manufactured synthetic fiber (recycled polyester and recycled nylon).

How-to knowledge is shared in this study by providing a list of resources to purchase sustainable textiles. Trade shows listed include TexWorld, Fabric Expo Show, Sourcing at
Magic, and DG Expo. Online resources listed include websites such as Global Organic Textile Standard, Aurora Silks, Swatch, Mood, Fabric and Queen of Raw. Other resources listed include jobbers, deadstock suppliers, smaller vertically integrated agencies, Deadstock District, Fabsrap, Brooklyn Fashion Design Accelerator Sustainable Fashion Roadmap, Council of Fashion Designers of America (CFDA) Sustainability Resources, textile magazines, associations and groups.

The findings of this research explained what sustainable textiles to select, why to select them, and how to purchase them. They provided practical methods for sewers, designers, educators, small apparel brands, and industry professionals. As a result of this study, the findings imply that integrating sustainable textiles is possible for designers and small apparel brands. They also imply that designers and small apparel brands are capable of being change agents and innovators by taking on this challenge to benefit society and the environment. Alternatively, these designers and small apparel brands expressed frustration with the complexity of finding information and accessibility of these textiles. However, they expressed their satisfaction with overcoming these challenges and knowing that they were minimizing harm to the environment and living things. There are probably many designers and small apparel brands that attempt to purchase items but give up due to the complexity of finding information and accessibility. This implies that the process of acquiring knowledge and accessibility needs to be simplified. What can the industry do to minimize these challenges for designers and small apparel brands?

Overall, designers and small brands need knowledge and understanding of the impacts of textiles as early as possible. Second, the findings support the need for clarity in terminology and a list of sustainable textiles with the advantages and disadvantages of each.
Third, the findings show that there is a need for a data base of sourcing websites, trade shows, and textile mills that sell these textiles to designers and small apparel brands with smaller minimum order quantities. The findings provide an initial list of recommendations for sourcing, which could reduce time spent researching, and improve inefficiency, sourcing issues, and traceability. This could serve as a great resource to promote the adoption of sustainable textiles. This could improve cost, variety, demand, and minimums. It may not solve all the problems within the lifecycle of an apparel textile, but it definitely is a start.

Fourth, findings also show that designers and small businesses would like some type of consistent organic, blue sign, or tracking labeling on apparel made from materials composed of sustainable textiles to make it easier to identify sustainable textiles. Lastly, this may not have been discussed in the findings, but there needs to be an infrastructure set up for the collection of apparel at the end of the lifecycle for biodegrading or recycling. Although there was information shared in this study, there still is a need for additional resources to help designers and small apparel brands understand what options are available to them and how to purchase sustainable textiles (Figure 5.1).
Figure 5.1. The needed resources for integrating sustainable textiles.

Theoretical Implications

Based on the literature review, a working definition for sustainable textiles can be proposed. Sustainable textiles are made from non-blended fibers that are produced, distributed, utilized, and disposed of in a way that is: (a) environmentally responsible by eliminating or minimizing chemical pollution, use of natural resources, waste accumulation, and animal harm; (b) socially responsible by assuring fair labor practices and can include domestic sourcing; (c) economically responsible by using its resources efficiently and responsibly so that it can operate to produce a consistent operational profit.

Findings suggest that the relative advantage of minimizing environmental and social impacts may override the complexity of purchasing for designers and small apparel brands purchasing sustainable textiles. Thus, Rogers’ (2003) diffusion of innovation-decision model could be expanded to include these concepts. In the persuasion stage of the diffusion of innovation-decision process, there are perceived characteristics of “relative advantage,
compatibility, complexity, trialability, and observability” (Rogers, 2003, p. 175) that influence a favorable or unfavorable attitude toward adoption/purchase. Rogers (2003) also stated that “relative advantage is often expressed as economic profitability” (p. 229). “Sub-dimensions of relative advantage include economic profitability, low initial cost, a decrease in discomfort, social prestige, a savings of time and effort, and immediacy of reward” (Rogers, 2003, p. 233).

Relative advantage in this study was expressed as environmental and social impacts. This implies that there was a shift in thinking among these designers and small apparel brands that prioritized environmental and social responsibility over higher profit margins. Environmental and social responsibility should be added sub-dimensions of relative advantage in the diffusion of innovation-decision process for designers and small apparel brands. The findings demonstrate evidence of innovative practices by designers and small apparel brands who chose to adopt sustainable textiles. This innovation of minimizing environmental and social impacts through textile selection is a beneficial, innovative practice for students, designers, SME’s and to the apparel industry overall.

Limitations and Further Research

The scope of this study had a few limitations. Much of the research has focused on the environmental dimension of sustainability, which is an area that needs more attention in fashion. Further research could include focusing on all dimensions of sustainability related to sustainable textiles purchased by designers and small apparel brands. The research was limited to 14 participants, which was relatively small. Increasing the research population could provide more findings to add to the information. This research was also limited to sustainable textiles. It did not focus on dyeing, printing, finishing, and production methods,
which are known to cause environmental concerns. It was limited to designers and small apparel brands in the United States that had purchased sustainable textiles. Interviews with designers who purchase sustainable textiles in other countries would provide a global perspective on the concept. This research was limited to purchasing sustainable textiles. Expanding the research to understand the end-of-life of the sustainable textiles (textile disposal) is another area that needs more attention in sustainability.

Further research should include a content analysis of the following: small apparel brands that claim to sell products containing sustainable textiles but do not; existing informational resources listed in the findings; online retailers of sustainable textiles with pricing; and price points of products made with sustainable textiles. Further research could also include small apparel brands that purchase sustainable textiles but do not market them; sourcing sustainable textiles with no minimums online and at trade shows; fair trade and organic labeling for fashion brands; domestic sustainable textile sourcing options; current networks of industry professionals affiliated with sustainable textiles; academic institutions that use sustainable textiles; dyeing and finishing methods of sustainable textiles; and end-of-life infrastructures for circular sustainable textiles for small apparel brands.
REFERENCES


The project referenced above has been declared exempt from most requirements of the human subject protections regulations as described in 45 CFR 46.104 or 21 CFR 56.104 because it meets the following federal requirements for exemption:

2018 - 2 (ii): Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) when any disclosure of the human subjects’ responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, educational advancement, or reputation.

The determination of exemption means that:

- You do not need to submit an application for continuing review. Instead, you will receive a request for a brief status update every three years. The status update is intended to verify that the study is still ongoing.

- You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, nature or duration of behavioral interventions, use of deception, etc.), any change in privacy or confidentiality protections, modifications that result in the inclusion of participants from vulnerable populations, removing plans for informing participants about the study, any change that may increase the risk or discomfort to participants, and/or any change such that the revised procedures do not fall into one or more of the regulatory exemption categories. The purpose of review is to determine if the project still meets the federal criteria for exemption.

- All changes to key personnel must receive prior approval.

- Promptly inform the IRB of any addition of or change in federal funding for this study. Approval of the protocol referenced above applies only to funding sources that are specifically identified in the corresponding IRB application.
Dear XXXX,

I am a graduate student working on my Master’s Thesis at Iowa State University. I am studying the factors that affect the decision to purchase sustainable textiles. I am interviewing designers (18 and older) and small businesses that have purchased environmentally sustainable textiles. If you have purchased what you consider as a sustainable textile your participation is needed. Interviews can be by phone or email and should not take more than 40 minutes of your time.

Have you purchased sustainable textiles? If yes, I would like to interview you. If you would like to participate, email me at jsingram@iastate.edu.

Your participation will be greatly appreciated and help move academia and industry forward in designing for sustainability. I look forward to hearing from you at your earliest convenience.

Thank you,
Jennifer Ingram
M.S. Candidate
Apparel, Merchandising, and Design
Iowa State University
APPENDIX C

CONSENT FORM

This study is being conducted by myself, Jennifer Ingram, MS candidate at Iowa State University along with my major professor Dr. Ellen McKinney.

**Purpose:** To explore the decision process of purchasing sustainable textiles when making apparel for designers and small businesses. You must be 18 years or older and have purchased what you have considered as a sustainable or circular textile to make apparel.

**What you will do in the study:** You will answer questions via email or an audio-recorded phone interview. The interview should not take longer than 20 minutes. The interview will include questions about what, how, and why you purchase sustainable textiles.

**Risks:** There are no risks by participating.

**Benefits:** By participating, you will contribute to the research on sustainability in fashion. Findings can be used a resource or tool for designers, industry professionals, and educational institutions to move research and industry forward in designing for sustainability. This study may help others in the decision-making process for selecting and purchasing sustainable textiles.

**Confidentiality:** The records for this study will be kept private. In any sort of report, we make public, we will not include any information that will make it possible to identify you. Research records will be kept in a locked file; only the researcher and major professor will have access to the records. All recorded interviews will be destroyed after the tape is transcribed, we anticipate this will be done within two months of its recording.

**Voluntary participation:** Your participation in the study is completely voluntary.

**Right to withdraw from the study:** You have the right to withdraw from the study at any time.

**If you have any questions about the study, contact:** The researchers conducting this study are Jennifer Ingram, jsingram@iastate.edu or 314-503-1480 and Dr. Ellen McKinney.

You will be given a copy of this form to keep for your records.

**Statement of Consent:** I have read the above information and received answers to any questions I asked. I consent to take part in this study.

**Signature:**

______________________________ Date:_________________

Name (printed) ________________________________
# APPENDIX D

## INTERVIEW QUESTIONS

| Participant Information | 1. What city and state do you live in?  
2. What is your occupation? (Small Brand, Designer, or Fabric Retailer)  
3. If small brand, what is the company size? |
|--------------------------|---------------------------------------------------------------------------------------------------|
| RQ1: Knowledge-In the U.S., how do designers and small apparel brands that have purchased sustainable textiles describe this concept? | 1. How did you learn about sustainable textiles/fabrics and/or circular fabrics?  
2. How would you define the term sustainable textiles/fabrics and/or circular fabrics?  
3. Please name as many sustainable textiles/fabrics and/or circular fabrics as you can (list the fabric content and name). |
| RQ 2: Persuasion: What persuaded these designers and small apparel brands to form a favorable attitude toward sustainable textiles? | 1. Simplicity: When seeking information about sustainable textiles, is it easy to find? Please explain.  
2. Trialability: Before purchasing, did you see a sample of the textiles? If so, how? (Ordered a sample, saw a sample in a showroom, saw a garment made from the fabric, etc.)  
3. What are the minimums when purchasing this or these textiles?  
4. Relative Advantage: When did you begin to form a favorable attitude toward sustainable textiles? Why? |
| RQ 3: Decision: What activities led to the choice to adopt sustainable textiles? | 1. Please explain the process for purchasing sustainable textiles. (online, at a fabric show, etc.).  
2. What sustainable textiles/fabrics and/or circular fabrics have you purchased (list the fabric content and name)?  
3. Are there any sustainable textiles/fabrics that you have wanted to purchase but could not find where to purchase? If so, what was the fabric? |
| RQ 4: Implementation: How do designers and small apparel brands put sustainable textiles to use? | 1. What apparel item was made with this or these sustainable textiles? |
| RQ 5: Confirmation: What reinforcements do designers and small apparel brands have after purchasing sustainable textiles? | 2. What are the advantages of purchasing this or these textiles?  
3. What are the disadvantages of purchasing this or these textiles?  
4. What places do you recommend for sourcing/purchasing this or these textiles for designers and small businesses?  
5. Do you think people should only use sustainable textiles when making apparel? Why or why not?  
6. Do you think it would be beneficial for people to have a tool that explains a clear definition of sustainable fabrics with a list of the fabric content/names and places to purchase them? Why or why not? |
# APPENDIX E

## DATA PLANNING MATRIX

<table>
<thead>
<tr>
<th>What do I need to know?</th>
<th>Why do I need to know this?</th>
<th>What kind of data will answer the question?</th>
<th>Whom do I contact for access?</th>
<th>Timelines for acquisition?</th>
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<tr>
<td>What sustainable apparel textiles are purchased by SME’s in the United States? Where</td>
<td>To better understand the decision-making process for selecting and purchasing sustainable</td>
<td>A qualitative approach is used. Semi-structured synchronous video interviews with industry professionals</td>
<td>The designers and industry professionals affiliated with small to medium-sized apparel brands located in the United States that sell apparel made from sustainable textiles. These participants will be found through an online content analysis.</td>
<td>The data will be collected and analyzed in September, and the data will be analyzed in October/November.</td>
</tr>
<tr>
<td>are these sustainable textiles purchased?</td>
<td>sustainable textiles for small to medium apparel firms, and educational institutions.</td>
<td>affiliated with selecting and purchasing textiles for SME apparel brands. These interview questions will</td>
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<td>explore the decision-making process in the diffusion of innovation theory.</td>
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APPENDIX F

LITERATURE REVIEW MAP

- Sustainable Apparel
  - Textiles Selection and Purchasing SMEs
    - Sustainability and the Apparel Lifecycle
      - Designers as Change Agents
      - SME's and the Apparel Industry
      - Diffusion of Innovations-Decision Process
    - Sustainable Considerations when Selecting Textiles
      - Biodegradable
      - Recycled
      - Reclaimed Fibers
      - Organically Grown
      - Low water usage
      - Low energy usage
      - Low chemical usage