ABSTRACT

LI, JITONG. The Impact of Communication on Consumers’ Knowledge, Attitude and Purchase Intention Related to Sustainable Apparel. (Under the direction of Dr. Karen K. Leonas).

The purpose of this research is to investigate consumer knowledge of sustainable apparel and examine the effects of communication, referring to providing consumers with related information regarding sustainable apparel. Specifically, objective one is to develop instruments to assess consumer knowledge of sustainable apparel. Objective two is to investigate the impacts of communication by examining direct outcomes (knowledge) and indirect outcomes (attitudes and intentions). Two communication methods, hangtags (H) and product webpages (W) were considered.

Concerning the first objective, instruments used to evaluate consumers’ knowledge of environmentally sustainable apparel (ESA) and socially sustainable apparel (SSA), in the literature were reviewed. The instruments were compared with the critical issues and sustainable practices in the T/A industry to investigate gaps. Finally, four instruments were established to measure consumers’ objective knowledge of ESA (OBK-ESA), subjective knowledge of ESA (SUK-ESA), OBK-SSA, and SUK-SSA.

The second objective was achieved via the quantitative research method, a survey. There were two kinds of sustainable apparel (ESA and SSA) and two communication methods (H and W). Hence, a 2×2 factorial design was employed. Participants were Generation Y and Generation Z adult consumers. They were randomly assigned one of the four questionnaires (ESA-H, ESA-W, SSA-H, and SSA-W).

There were 702 useable responses. It was found that participants’ SUK-ESA was significantly higher than their OBK-ESA after reading the related information on hangtags or webpages. Furthermore, the effects of communicating with consumers via hangtags on
consumers’ SUK-ESA, SUK-SSA, attitudes toward the impact of purchasing ESA (ATT-ESA), intentions to purchase ESA (INT-ESA), and intentions to purchase SSA (INT-SSA) were confirmed. Similarly, the effects of communicating with consumers via product webpages on consumers’ SUK-ESA and ATT-ESA were supported. Additionally, the effects of information regarding ESA provided via hangtags and product webpages on consumers’ OBK-ESA were significantly different, and hangtags were more effective than webpages.

This study provides several theoretical implications. The consumer knowledge assessment instruments developed in this study make up for the deficiency in existing instruments and assist other researchers’ further studies on consumer knowledge, consumer behavior, and communication. Additionally, this study provides in-depth insights on consumer knowledge of ESA and SSA by investigating consumer knowledge before and after communication based on the structure of knowledge. Along with the theoretical implications, this study also offers practical implications. The T/A industry can use this study’s findings to improve communication with consumers and aid in sustainable product distribution.
The Impact of Communication on Consumers’ Knowledge, Attitude and Purchase Intention Related to Sustainable Apparel

by
Jitong Li

A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Textile Technology Management

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DEDICATION

This dissertation is proudly dedicated to my beloved parents,

Sumin Gao and Wenhe Li.

Thank you for your endless love, sacrifices, and support.
BIOGRAPHY

Jitong Li was born in 1994 in Liaoning, China. She obtained her bachelor’s degree in Textile Engineering, Knitting and Clothing from Donghua University, Shanghai, China. Benefitting from the 3+X program between the colleges of textiles at Donghua University and North Carolina State University, she came to the United States in 2015. She received a Master of Textiles degree in Textile and Apparel, Technology and Management from the Wilson College of Textiles at North Carolina State University in 2017. While completing the master’s program, she realized her passion for academic work and decided to pursue her doctoral degree. During the four years (2017-2021), she conducted multiple studies on sustainability, such as consumer behavior regarding sustainable fashion products, representation of sustainability in mass communication, and sustainability topic trends in the textile and apparel industry. Her current research interest includes sustainability communication, using text mining to investigate topic trends, consumer behavior, circular product design, product development, and product lifecycle management in the textile and apparel industry.
ACKNOWLEDGMENTS

Throughout the writing of this dissertation, I have received a great deal of support and assistance. I would like to express my most profound appreciation to my advisor, Dr. Karen K. Leonas, whose expertise was invaluable in formulating this research. Without the interest in sustainability inspired by her, I may not have ever pursued this challenging area. Her insightful guidance and useful feedback pushed me to sharpen my thinking and brought my work to a higher level. This work would not have been possible without her treasured support.

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I must thank Hanesbrands for the funding opportunity to deliver the survey of this dissertation. I also thank the graduate students who attended the pilot study and all participants of the study.

Many thanks to my beloved family for their endless love, encouragement, and support throughout my studies and life in the United States. I would also like to offer my special thanks to my friends, who provided sympathetic ear and their happy distractions to rest my mind outside of my research.
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CHAPTER 1

INTRODUCTION

There is an increasing importance of sustainability in the textile and apparel (T/A) sector, not only for companies but also for consumers (The Business of Fashion & McKinsey Company, 2020; Turker & Altuntas, 2014). With the establishment of the United Nations Alliance for Sustainable Fashion (2020), more and more T/A companies are committing to reducing this industry’s negative environmental and social impacts. Sustainability is also an essential topic for consumers with increasing concerns and interests about sustainable products (Sustainability Concerned Consumers, 2018).

The United Nations emphasized the necessity of educating consumers on sustainable consumption and providing them with adequate information on sustainable products (United Nations, 2015). Additionally, researchers encouraged effective communication between companies and consumers to improve consumers’ knowledge, attitudes, and purchase intentions toward sustainable apparel (Kang et al., 2013; Kozar & Connell, 2015; Okur & Saricam, 2019). However, this industry and academia’s efforts to educate and inform consumers regarding sustainable apparel are still incomplete. Hence, using the quantitative methodology, the impacts of communication between companies and consumers regarding sustainable apparel and sustainability are of interest in this dissertation research. Communication refers to providing consumers with related information regarding sustainable apparel.

Statement of Research Background

This dissertation investigates the impacts of communication between companies (brands and retailers) and consumers regarding sustainable apparel by comparing consumer communication outcomes (knowledge, attitudes, and intentions) concerning sustainable apparel.
Accurately, consumers’ knowledge, attitudes, and intentions toward sustainable apparel before and after receiving information from various communication (hangtags and product webpages) are compared. This section comprises a brief research background of consumer communication regarding sustainable apparel and begins with an introduction to sustainable development history.

**Sustainable Development and Sustainability**

As early as 1987, the notion of sustainable development as an approach to achieving sustainability was introduced and described by the World Commission on Environment and Development (WCED) in the Brundtland Report. Sustainable development was defined as development that met the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). This definition emphasized natural resource protection and rational use of natural resources. It was a logical definition and argument for its time (the 1980s) since there was a conspicuous gap between environmental concerns about the increasingly evident ecological consequences of human activities and socio-political concerns about human development issues in the 1960s, 1970s, and early 1980s (Robinson, 2004).

The concept of sustainable development in the Brundtland Report was a milestone that triggered discussion and attention on the issues related to sustainable development from diverse groups worldwide. However, with the growth in business and the emergence of new problems in society, it was no longer feasible to accomplish sustainable development and achieve sustainability through concentrating on environmental concerns exclusively. Gradually, during the 1990s, it was recognized that the implementation of sustainability should rely on the integration of three essential principles: environment, society, and economy, which were also
referred to as “3Ps” - planet, people, and profit (Elkington, 1998; Kates et al., 2005; Summit, 1997). The 3Ps constitute the Triple Bottom Line (TBL) framework, which has been adopted by some organizations to evaluate their sustainability performance in a comprehensive perspective (Elkington, 2013).

Sustainable development and sustainability are frequently discussed by various groups, such as the United Nations (UN), a principal initiator and driver of this issue at the international level. In 2002, the UN World Summit on Sustainable Development in Johannesburg, South Africa, was held, and in 2012, the Conference on Sustainable Development was held in Rio, Brazil (United Nations, 2015). In these conferences, regardless of the specified agendas or set goals, the three principles mentioned above, planet, people, and profit, were always guides to implement sustainability. Correspondingly, for today’s business, sustainability means protecting finite resources and the environment, respecting people with different cultures, keeping business stable, and serving its core challenges.

**Sustainability in the Textile and Apparel Industry**

**Issues**

The T/A industry plays a vital role in local, regional, national, and international economies. As a 2.4 trillion-dollar industry, this industry employed approximately 75 million people worldwide in 2020 (United Nations Alliance for Sustainable Fashion, 2020). However, there are significant issues related to sustainability recognized to be caused by this industry, to the detriment of society, ecology, and economy (Connell & Kozar, 2012). It is responsible for 8-10% of the world’s greenhouse gas emissions, 20% of industrial wastewater pollution worldwide, and the loss of 500-billion-dollar value every year due to clothing underutilization and lack of recycling (United Nations Alliance for Sustainable Fashion, 2020).
The process of transforming raw materials into finished T/A products, use, and disposal can have adverse environmental effects (Karthik & Gopalakrishnan, 2014). The United States Environmental Protection Agency (2015) estimated that the generation of textile waste in the U.S. in 2015 was 16 million tons. Of this, 10.5 million tons were sent to landfills, and it was 7.6 percent of all municipal solid waste (MSW) landfilled. These figures represent a considerable number of consumed resources and imply substantial pollution in the production and disposal processes.

In one of the world’s largest textile producing countries, China, the textile industry ranked fourth in pollution production among 41 Chinese key survey industries for 12 years (2003–2014), primarily due to its large amount of discharged wastewater (Li et al., 2018). In 2015, 10.1% of total industrial wastewater was released by this industry in China (Li & Wang, 2019). Annually 190 million people fall ill, and 60,000 people die from diseases (i.e., liver and gastric cancer) caused by water pollution from all industries in China (Tao & Xin, 2014).

In addition to the environmental issues, as a labor-intensive industry, social issues, like child labor, low wages, hazardous work conditions, and long work hours, have been related to this industry for a long time. Also, animal welfare is recognized to be associated with T/A companies’ social responsibility, as this industry has used animal-based materials, such as leather and wool, for years (Lundblad & Davies, 2016). Ultimately, the accumulated environmental and social issues will lead to damage to companies’ profits and images.

Traditionally, in finance, the economic value is a company’s bottom line and corporate profit measurement. Whereas, in sustainability, it means making sure the business makes a profit, and the relevant operations do not create social or environmental issues that would harm the company’s long-term success (Jackson et al., 2011). Since addressing social and
environmental issues would contribute to a company’s or industry’s economic value, this study focuses on sustainability’s environmental and social dimensions.

**Sustainable Practices & Apparel**

Issues related to sustainability, including social and environmental sustainability, are severe and extensive in the T/A industry. During the past few years, the issues have received considerable attention from companies, researchers, and also consumers (Austgulen, 2016; Shen, 2014). For example, the collapse of the eight-story commercial building, Rana Plaza in Bangladesh in 2013 that resulted in the deaths of more than 1,000 garment workers, aroused widespread public, companies’ and political concerns for working conditions in the T/A industry (Yardley, 2013). Wal-Mart Store Inc. broke with its major European retailers by announcing its plan on improving safety in Bangladesh factories (“Walmart outlines own Bangladesh,” 2013).

An example of environmental issues that have attracted considerable public attention is textile waste. To reduce the amount of textile waste sent to landfills, companies such as Eileen Fisher, H&M, Patagonia, and The North Face, have developed take-back programs to keep textile waste out of the landfill. For example, Eileen Fisher asked their consumers to bring back unwanted pieces in return for a gift card, and they collected 220,000 items of used clothing in 2018. The collected clothes in pristine condition (about 60% of collections) were cleaned and resold under the Renew brand, while lightly damaged pieces are recycled into new pieces (Wicker, 2019).

With environmentally and socially sustainable practices increasingly adopted in this industry, the term “sustainable apparel” is emerging, and it can be regarded as a sub-category of sustainable products. Generally, sustainable products have been described as products that provide environmental, social, and economic benefits while protecting public health and the
environment over their entire life cycle, from raw materials extraction until the final disposal (Peattie & Belz, 2013). Similarly, environmentally sustainable apparel (ESA) and socially sustainable apparel (SSA) is the apparel produced under environmentally or socially sustainable practices, respectively (Kang & Kim, 2013; Kim & Damhorst, 1998; Kozar & Connell, 2013). For example, ESA can be the apparel made from recycled or organic material, the garment dyed with water-saving techniques, or apparel products free of harmful chemicals. Additionally, SSA can be the clothing made by fair labor. Correspondingly, consumer knowledge of sustainable apparel is consumers’ awareness of the T/A industry’s negative impacts and relevant, sustainable practices.

**Importance of Communication regarding Sustainable Apparel**

Although researchers and companies have attempted to accelerate the sustainability implementation process in the T/A industry, especially by addressing the issues in the production and disposal processes, there is another crucial sector that should not be neglected - consumers. More than twenty years ago, this industry was identified as a consumer-driven industry (Butler & Francis, 1997). More recently, this industry is still highly consumer-driven since consumers’ knowledge, values, and perceptions, significantly impact the demand for products, including sustainable apparel in this industry (O’Rourke, 2014). In 2018, a research report from Cotton Incorporated identified that 86% of consumers worldwide were concerned about sustainability, increasing from 2017 (Sustainability Concerned Consumers, 2018). Consumers’ increasing awareness and interest in sustainability during the past few years have exerted pressure on the T/A industry to incorporate sustainable manners and offer sustainable products (Yang & Dong, 2017).
Considering that consumers are vital drivers of this industry and have a growing interest in sustainability, researchers have completed an increasing number of studies related to consumers and sustainability. For instance, in the database of PsycINFO, academic journal articles published from 1999 to 2018 were searched with the keywords permutated and combined from three categories, including category 1 (consumer), category 2 (apparel, textile), and category 3 (sustainability, corporate social responsibility, environment). Eventually, six keyword groups were employed, and 176 articles were retrieved. During these two decades, from 1999 to 2018, although there were some minor fluctuations, the overall trend was upward (Figure 1.1). Also, according to the forecast line, the number of related journals will keep sustained growth.

**Figure 1.1**

*Numbers of Articles Retrieved from the PsycINFO Database (1999-2018)*

![Graph showing the number of articles retrieved from PsycINFO database from 1999 to 2018.](image)

Further, a review of the contents and objectives of these articles was conducted. A portion of these studies aimed to obtain an overall understanding of the hierarchical and interactive relationship among consumers’ concern, attitude, behavioral intention, willingness to pay, and the actual purchase behavior (Cowan & Kinley, 2014; Kang et al., 2013; Kozar & Connell, 2013). However, rather than involving all these items listed above, other studies
concentrated on the part of the intricate relationship (Hustvedt & Dickson, 2009; Kim et al., 2012). In most of the studies’ experimental designs related to consumer behavior, “knowledge” was frequently mentioned as a predictor of consumer attitude or purchase intention. Moreover, when the researchers analyzed their research results, the importance of consumers’ knowledge regarding sustainability was underscored, and the fact consumers lacked sustainability knowledge was identified (Connell, 2011; Laitala & Klepp, 2013; Shen et al., 2012). Communication with consumers, referring to providing consumers with information about sustainable apparel, was suggested by these researchers to improve consumers’ purchase intentions and impel sustainability achievement.

Additionally, the importance of communication has also been accentuated in industry research reports and conferences. Karp (2018) emphasized communication when presenting their research report related to millennials and textile sustainability in the American Apparel & Footwear Association (AAFA) webinar. Messura (2018) explained the importance of communication to educate consumers in his presentation at the Cotton and Sustainability Symposium at the Wilson College of Textiles on November 1, 2018. Besides, the United Nations (UN) included consumer communication as a part of the Sustainable Development Goal (SDG) 12 in their 2030 Agenda (2015) as follows,

“*There also needs to be significant focus on operating on supply chain, involving everyone from producer to final consumer. This includes educating consumers on sustainable consumption and lifestyles, providing them with adequate information through standards and labels, and engaging in sustainable public procurement, among others. *” - SDG GOAL12
In general, professionals from academia, industry, and international organizations have recognized the need to conduct additional, more in-depth research on consumer communication concerning general sustainable products and sustainable apparel.

**Research Objectives**

Considering the importance and lack of research regarding consumer communication on sustainable apparel, the purpose of this dissertation research is to investigate the impacts of communication between companies and consumers on sustainable apparel by examining communication outcomes. Consumer knowledge was used as a direct outcome to examine the impacts of communication (Bhattacharya & Sen, 2004; Kim, 2017). Hence, consumer knowledge of sustainable apparel was applied as a direct outcome of communication on sustainable apparel in the present research. Moreover, knowledge was considered a predictor of consumers’ attitudes and purchase intentions toward sustainable apparel (e.g., Connell & Kozar, 2012; Kang et al., 2013). Thus, attitudes and intentions were used as indirect outcomes to investigate the impacts of communication.

A lack of research systematically assessing consumer knowledge related to sustainable apparel, albeit “knowledge,” appears to be a significant factor in this study to analyze communication impacts. In various studies, knowledge on sustainability related to T/A has been identified as a predictor of consumer behavior (attitude or consumption), whereas insufficient studies concentrated on “knowledge” as expected. Even in the limited research, the findings and results generated regarding the impact of knowledge are different.

As shown in Table 1.1, six of the eight studies exhibited a positive relationship between knowledge and consumption or attitude, whereas, in the other studies, there was no significant relationship between knowledge and consumption or attitude. In these studies, different methods
were used to assess consumer knowledge, which may have caused the results to lack consistency.

However, it is notable that there has not been a specific instrument to categorize or assess consumer knowledge in the extant literature. Hence, it is crucial to solving the fundamental problem first – developing knowledge assessment instruments to measure consumer knowledge related to sustainable apparel. Solving this problem is another objective of this dissertation research.

Table 1.1

Relationship Identified in the Research related to Consumer Knowledge of Sustainable Apparel

<table>
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<th>Positive Relationship Results</th>
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<tr>
<td>Author, Year</td>
</tr>
<tr>
<td>1 Brosdahl &amp; Carpenter, 2010</td>
</tr>
<tr>
<td>2 Connell, 2010</td>
</tr>
<tr>
<td>4 Shen et al., 2012</td>
</tr>
<tr>
<td>5 Kozar &amp; Connell, 2013</td>
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<td>6 Kang et al., 2013</td>
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<table>
<thead>
<tr>
<th>None/Unclear/Limited Relationship Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author, Year</td>
</tr>
<tr>
<td>1 Kim &amp; Damhorst, 1998</td>
</tr>
<tr>
<td>2 Dickson, 2000</td>
</tr>
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Note. Relationship refers to the relationship between knowledge and consumption/attitude.

There are two objectives for this study:

Objective 1: Develop instruments to assess consumer knowledge of sustainable apparel and assist in the implementation of objective 2.
Objective 2: Investigate the impacts of various communication methods by examining both direct and indirect outcomes.

Figure 1.2 shows these two objectives, outcomes related to each objective, and the relationship between these two objectives. The outcome of the first objective, a knowledge assessment instrument, will be used to assess the direct outcome, consumer knowledge related to the second objective. And the assessed consumer knowledge will be linked to the indirect outcomes, consumer behavior associated with the second objective.

Figure 1.2

Relationships of Objectives and Their Outcomes

Objective 1:
Develop Instruments to Assess Consumer Knowledge of Sustainable Apparel

Objective 2: Investigate the Impact of Various Communication Methods

Developed Assessment Instruments

Direct Outcome: Consumer Knowledge

Indirect Outcome: Consumer Behavior
Significance of the Study

The first objective of this research is developing instruments to assess consumer knowledge regarding sustainable apparel, referring to issues and sustainable practices in the T/A industry. Thus, 1) theories related to consumer knowledge assessment are reviewed to identify the framework of consumer knowledge assessment; 2) primary issues and sustainable practices in the T/A industry are reviewed; and 3) a review of the sustainable apparel knowledge assessment instruments employed in the existing literature is undertaken to explore the fundamental structure of knowledge assessment instruments and the essential items involved in instruments. The gaps in existing knowledge assessment instruments are identified by comparing the primary issues and sustainable practices with items in the existing knowledge assessment instruments. Further, the instrument used in this study to assess consumer knowledge of sustainable apparel is developed.

Overall, the significance of the first objective is 1) providing information related to issues and sustainable practices in the industry; and 2) developing a sustainable apparel knowledge assessment instrument to make up for the deficiency and assist other researchers’ further studies on consumer knowledge, consumer behavior and also consumer communication.

The second objective of this research is investigating the impacts of various communication methods. A survey was employed to collect the data related to the communication impacts. Specifically, the same questions in one questionnaire are completed twice by the same participant. The first time, the participant answers some questions about knowledge, attitude, and intention without any communication on sustainable apparel. The second time, he/she is asked to answer the same questions after reading relevant information on sustainable apparel through hangtags or webpages of products.
Therefore, this study provides in-depth insights on consumer knowledge of sustainable apparel and examines if consumers have limited knowledge of sustainable apparel. The results enrich the literature on consumer behavior related to sustainable apparel. Moreover, it improves the body of knowledge on communication with consumers on sustainable apparel. It also provides the T/A industry with guidance and advice on appropriate or effective communication methods that can be used in future communication with consumers.

In summary, by developing knowledge assessment instruments and examining communication outcomes, this research benefits both the industry and academia. Better understanding regarding consumers is created, impacts of multiple communication methods are summarized, and further, the sustainable development process in T/A will be facilitated.
Research Limitations

There are limitations to this research. First, sustainability is a dynamic and complex concept that will change with the development of society, economy, and others. This research mainly focuses on the two dimensions, the environmental and social dimensions. Additionally, sustainable apparel is an obscure and controversial term, and there is no unanimous delineation of it found in extant literature. In this research, sustainable apparel is described as apparel with social or environmental sustainability attributes. Dissidence and prejudices may be produced due to the definition of sustainability and sustainable apparel.

Secondly, the T/A supply chain is complex. Consequently, knowledge of sustainable apparel is exceptionally comprehensive, which indicates that it is not possible to involve all items related to sustainable apparel knowledge in one assessment instrument. Hence, judgment and adjustment will be brought into the assessment instruments’ development process, and sequentially bias may be generated.

Lastly, the questionnaire participants are only those in the United States. Their knowledge of sustainable apparel or their reaction to communication cannot represent others who live elsewhere in the world with different cultural or social milieu. Hence, these research results are regional, and it will not be appropriate to generalize the research results to a large population scale.
CHAPTER 2
LITERATURE REVIEW

To achieve this study’s objectives, it is vital to understand the significance of sustainability and consumers in the textile and apparel (T/A) industry. This chapter first expounds on sustainability’s importance in this industry by describing sustainability’s history, the T/A industry, and issues in this industry. Then, starting with the association between the T/A industry and the sustainable development goals, the primary attributes of sustainable apparel are classified and enumerated. These attributes represent the sustainable practices in the T/A industry and help explain the concept of sustainable apparel. Later, the significance of T/A consumers is demonstrated, and theories related to consumer behavior in the literature are reviewed to provide theoretical support for this research. Also, the needs for communication and various communication methods in the market are discussed. Theories of consumer behavior and outcomes of communication are merged to provide additional theoretical foundations. Based on the entire review of literature, hypotheses of this dissertation are developed at the end of this chapter.

Sustainability
The History of Sustainable Development and Sustainability

Sustainable development is an approach to achieve sustainability. The emergence of sustainability and sustainable development is an accumulated result of several significant events under particular social circumstances. According to the work of Mebratu (1998), the history of the concept of sustainability can be categorized into three periods: Pre-Stockholm, covering the period until the Stockholm Conference on Environment and Development (1972); from Stockholm to the World Commission on Environment and Development (WCED) (1972–1987);
and Post-WCED (1987–1997). In this dissertation research, some extension was made in the third period as Post-WCED (1987-present). Based on several significant conferences and documents, a timeline was developed to exhibit the historical process of sustainable development in Figure 2.1.

**Figure 2.1**

*The Timeline of Sustainability*

<table>
<thead>
<tr>
<th>Before 1972</th>
<th>1972-1987</th>
<th>1987-Present</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Religious beliefs, Traditions</em></td>
<td><strong>1972:</strong> UN Conference on Human Environment in Stockholm, importance of environmental management &lt;br&gt;<em>1978:</em> the term “eco-development” appeared in the UN Environment Program review &lt;br&gt;<em>1980:</em> World Conservation Strategy, a major attempt to integrate the environment and development concerns &lt;br&gt;<em>1987:</em> “Brundtland Report”, the concept of sustainable development was first introduced and described</td>
<td><strong>1992:</strong> UNCED in Rio issued a declaration of sustainable development principles.  &lt;br&gt;<strong>2002:</strong> WSSD, Johannesburg Summit marked a formal generation of the three-dimension definition on sustainable development  &lt;br&gt;<strong>2012:</strong> UNCSD, Rio+20, reconciling the economic and environmental goals of the global community  &lt;br&gt;<strong>2015:</strong> New global Sustainable Development Goals &amp; 2030 Agenda for sustainable development</td>
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**Before 1972**

According to Figure 2.1, the first period is before 1972. Initially, living in harmony with nature and society was the core element of all traditions and beliefs (Mebratu, 1998). However, aligned with some significant global events, such as the First Industrial Revolution and World War II, living in harmony with nature and society decreased in realizability. As a result, people’s
beliefs were broken and reshaped several times. With the growth of population and emergence of some negative effects related to the First Industrial Revolution (the transition to new manufacturing processes in Europe and the United States, in the period from about 1760 to sometime between 1820 and 1840), such as inequalities, the theory of environmental limits from Thomas Robert Malthus was widely applied. According to Malthus’s theory, the per-capita food supply would be reduced with the population’s growth.

Consequently, the standard of living would be shifted to a lower level (Mebratu, 1998). People assumed that sufficient economic growth should be an optimal solution to this concern. However, after World War II (1939-1945), people were threatened again by the rapid population growth, pollution intensification, and resource depletion, which inflicted extreme damages on the environment. People’s survival as humans had also been restrained due to the resource scarcity and inequalities created by the unprecedented industrial and commercial expansion (Du Pisani, 2006). Thus, it was recognized that neither unlimited economic growth nor isolated conservation was desirable to the global development issues (Ward & Dubos, 1972).

1972-1987

During the second period in Figure 2.1, 1972 to 1987, the connection between environment and development was established and reinforced gradually as the term sustainable development. There were many debates among the pioneering scientists, technologists, policymakers, and communities at regional, national, and global levels. Early in this period, before the formal use of “sustainable development” in public, the question being debated was “Do development and environmental concerns contradict each other” (Lele, 1991). People attempted to look for feasible and valid approaches to exploit and utilize natural resources.
The 1972 UN Conference on Human Environment in Stockholm, Sweden, represented a momentous step toward breaking people’s stereotype on the contradictory relationship between environment and development. The importance of environmental management was recognized, and the use of environmental assessment as a management tool had been considered (DuBose et al., 1995). In 1978, with the emergence of “eco-development” in the UN Environment Program review, it was recognized internationally that environmental and developmental issues should be considered concurrently. Subsequently, in 1980, the World Conservation Strategy underscored the integration of environmental and developmental concerns (Mebratu, 1998). Until then, the coexistence of environmental concerns and development was adopted.

1987–Present

The “Brundtland Report,” published in 1987, resulted in the transformation of debate questions from “Do development and environmental concerns contradict each other” to “How can sustainable development be achieved?” (Lele, 1991). In this report, the concept of sustainable development was first formally introduced and described as the development that can meet the needs of the present without compromising future generations’ ability to meet their own needs. Although the primary element in this definition was environmental sustainability, in the same year, social sustainability and economy had also been indicated in “Report of the World Commission on Environment and Development: Our Common Futures” (Brundtland, 1987).

The various economic and social development stages among developing countries and between countries should be considered when translating concerns for the environment into greater co-operations. Further, shared and mutually supportive objectives should be achieved by considering the interrelationships between people, resources, environment, and development
(Imperatives, 1987). The concept of social sustainability and economy in the reports during the 1980s was still more nebulous than environmental sustainability (Brown et al., 1987).

Later in the 1990s, the critical sustainability concern was transformed to a broader scope along with an update on the definition of sustainable development. In 1992, Agenda 21 was issued in the United Nations Conference on Environment and Development (UNCED) in Rio (United Nations, 1992). Rio Declaration on Environment and Development and the Statement of principles for the Sustainable Management of Forests were included in Agenda 21 and adopted by more than 178 governments. There were two of the four sections, 50% of the agenda directly related to the social, economic, and environmental dimensions of sustainable development in this agenda. “Social and Economic Dimensions” was the first section, and “Conservation and Management of Resources for Development” was the second section (Parson et al., 1992). This was a significant step toward enriching the meaning of sustainable development by considering social and economic issues, albeit these two issues had not coalesced with the environment.

In the 1990s and continuing through the early 2010s, the influence of social sustainability and economy on sustainable development was more distinct. It was recognized that sustainable development should rely on the integration of three crucial principles: environment, society, and economy. Based on the discussions of potential sustainable development tactics, the World Summit on Sustainable Development (WSSD) in 2002 represented an official formation of the three-dimension definition of sustainability (Robert et al., 2005). This conference recognized that overarching objectives of and essential sustainability requirements were constituted by poverty eradication, changing consumption and production patterns, and protecting and managing the natural resource base for economic and social development.
In 2012, the United Nations Conference on Sustainable Development (UNCSD), also known as Rio+20, was held to reconcile the global community’s economic and environmental goals. Specifically, the Millennium Development Goals (MDGs) were the eight international development goals for 2015. Sequentially, new global Sustainable Development Goals (SDGs) with seventeen goals and the 2030 Agenda for sustainable development were set in 2015. This was an urgent call for a worldwide partnership and action to end poverty and other deprivations, tackle climate change, and preserve the oceans and forests by improving health and education, reducing inequality, and spurring economic growth (United Nations, 2015).

**Summary**

Overall, achieving sustainability should involve the simultaneous pursuit of economic prosperity, environmental quality, and social equity. This integration of environmental sustainability, social sustainability, and economy, also referred to as the triple bottom line (Elkington, 1998), is still prevalent and widely applied to perform and assess sustainability today. For different sectors or goals, each dimension’s weight should vary from each other to express sustainability or achieve sustainable development (Lozano, 2008). For instance, in business, revenue is needed to be maximized and considered a base to incorporate environmental or social sustainability. Inversely, the government is not supposed to be a profit-making venture, and the economic dimension should assist the social dimension (Kuhlman & Farrington, 2010).

Whatever the weights of dimensions, environmental and social sustainability can be expressed through specific products or operations and incorporated in economic strategies to implement sustainability. Addressing social and environmental issues would contribute to a company’s economic value, and companies regarding environmental and social sustainability as an opportunity and a source of competitive advantages is increasing (Longoni & Cagliano, 2015;
McWilliams & Siegel, 2011). Thus, this study focuses on sustainability’s environmental and social dimensions.

**Environmental Sustainability**

Environmental sustainability was discussed widely with the recognition of the finiteness and scarcity of natural capital (Goodland, 1996). Goodland described it as “maintenance of natural capital.” This definition constituted the input and output rules of environmental sustainability, including a set of constraints on the four major activities regulating the human economic subsystem's scale. The input rules involved using renewable and nonrenewable resources on the source side, and the output rules involved pollution and waste assimilation on the sink side. The balance between input and output must be maintained during the environmental sustainability period (Daly, 1988; Goodland, 1995). More specifically, environmental sustainability requests for the balance, interconnectedness, and resilience that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems nor by human actions diminishing biological diversity (Morelli, 2011).

**Social Sustainability**

Compared to environmental sustainability, the concept of social sustainability has a shorter history, and its definition is more ambiguous. Nevertheless, researchers made extensive efforts to unscramble and embody the meaning of social sustainability. Social sustainability aims to protect and guarantee the quality of life of all living beings, such as human beings the animals (Nista et al., 2020). Considering human rights, Sachs (1999) identified a series of constituent elements related to social sustainability, including equitable incomes and access to goods, services, employment, and social homogeneity. Social sustainability was later separated into three categories according to its elements and relationship with the other two dimensions
(environment and economy) as: ‘development sustainability’ on poverty and inequity; ‘bridge sustainability’ connecting with biophysical environmental goals; and ‘maintenance sustainability’ in the context of social and economic change (Dillard et al., 2008; Vallance et al., 2011). Different from the keyword “balance” in environmental sustainability, social sustainability is more about “equality” and “safety.” It is a positive and equal condition within communities and a process within communities that can achieve that condition.
The Textile and Apparel Industry

History

Production of T/A is ancient and can be traced back to 30,000 BC with the first bone needles (Backwell et al., 2008). It was conjectured that during that time, the majority of clothing was comprised of prepared animal hides, which were sewn together with various animal and vegetable fibers (Walton, 1912). After that, this industry experienced a slow and inefficient development process until the First Industrial Revolution.

Similar to the development process of sustainability, the evolution of the T/A industry was also inseparable from the Industry Revolution. Before the First Industrial Revolution, which began in the 1700s, most T/A production was completed in small-scale in-home workshops, known as cottage industries. Raw materials (fibers, mainly wool) were produced on people’s farms and sold to local communities. Later, merchants delivered raw materials to the workers’ homes to be converted into textile products. Here production was self-paced and required workers of all skill levels (Deane, 1979). Production via the cottage industry was too slow to keep pace with the growing demand resulting from the increasing population.

During the First Industrial Revolution, with textile machines’ invention, production efficiency was improved, while labor needs were reduced. During this time, there were two critical inventions, including the wheel shuttle developed by John Kay in 1733 and the spinning jenny created by James Hargreaves in 1764 (Walton, 1912). During the Second Industrial Revolution, which began in the mid-1800s, some significant innovations in the T/A industry were sewing machines, cutting knives, and pressing machines (Mokyr, 1998). By the end of the 19th century, this industry had transformed from craft production to machine production with higher production efficiency.
Nonetheless, this enormous increase in production did not lead to a harmonious social circumstance. It kept struggling domestic workers (mostly women) occupied and created a system of notorious sweatshops (Mokyr, 1998). According to Mokyr (1998), with machines’ emergence, workers were converted from craftsmen and craftswomen to “cogs in the wheels.” T/A work became fast-paced and dependent on the large amounts of capital controlled by capitalists. Inversely, workers could not keep their individuality, independence, and society’s reliance on their skills anymore. As a result, their hatred for society was bred. In England and France, angry tailors and weavers who saw the machinery as a threat to their livelihood stormed factories and wrecked the machinery (Walton, 1912).

After the Second Industrial Revolution, mills and factory conditions earned the attention of progressives and socialists. For example, in the United States, dangerous work conditions and labor issues were brought to the forefront when the Triangle Shirtwaist Factory Fire erupted on March 25, 1911 (Rosen, 2002). According to the details published by the United States Department of Labor (2019), there were 146 workers, many of whom were young women, who died that day, and the youngest two were 14 years old.

The fire spread through the cramped Triangle Shirtwaist Company garment factory on the 8th, 9th, and 10th floors of the Asch Building in lower Manhattan. The only one fire escape in this building collapsed during the rescue effort. Inside the building, workers were trapped by long tables and bulky machines or crushed as they struggled with doors locked by managers to prevent theft. Outside the building, ladders were too short of reaching the top floors, and safety nets were too weak to catch the workers jumped from the building. This fire drove a new public awareness of social issues, including safety and working conditions in this industry, and led to regulation establishment related to these issues.
Today, the T/A industry is very heavily dependent on technology, mostly incorporating the use of automation. However, some work is still primarily done with human labor, including fabric handling and sewing machine operation. Also, the majority of factories have moved from developed countries to developing countries where labor is cheaper. More issues have been identified with increasing demands for T/A products and global T/A production complexity rather than being solved. In general, the modern T/A industry is bifacial, with coexisting positive impacts on the economy and communities and issues related to society and the environment.

Overview of the T/A Industry’s Importance

**T/A Worldwide**

The T/A industry plays an important role economically and socially throughout the world. For many countries, this industry has contributed significantly concerning trade, Gross Domestic Product (GDP), and employment (Keane & te Velde, 2008). Followings are some key figures related to this industry and its impacts.

- In 2018, the global textile mills market’s value was estimated to be $925.3 billion (around 83.7% were fabrics, and 16.3% were yarns). And it was forecast to reach $1.23 trillion by 2025 (Grand View Research, 2019).

- The global apparel retail market’s value totaled $1,414.1 billion in 2017 (52.6% womenswear, 31.3% menswear, and 16.1% childrenswear) and was forecast to reach $1,834 billion in 2022 (Lu, 2018).

- The T/A industry’s contribution to incomes differs by country, which is relatively more significant in developing countries (low and middle-income countries) and smaller in developed countries. For example, textile and apparel manufacturing's contribution to
GDP is up to 5% in Sri Lanka, 15% in Pakistan, but only 0.15% in the United States in 2017 (Lu, 2019a).

- According to the most recent World Trade Statistical Review from the World Trade Organization (WTO) (2019), the value of T/A exports totaled $315 billion and $505 billion in 2018, which accounted for around 4.2% of world exports. T/A is the dominant source of exports in some countries, especially in low-income and developing countries. China continues to be the leading exporter of T/A items, albeit its market share in world apparel exports fell from its peak of 38.8% in 2014 to 31.3% in 2018 (Lu, 2019b). By calculation, the total T/A exports from China in 2018 totaled about $257 billion and accounted for 5.6% of China’s total exports in 2018 (World Trade Organization, 2019).

- The T/A industry is an essential resource in alleviating the pressure of employment. Seventy-five million people are employed worldwide (mostly women). Employment in T/A manufacturing for the least developed and low-income countries accounts for a high manufacturing employment share. For example, it accounts for 75% in Bangladesh (Keane & te Velde, 2008).

**T/A in the United States**

This industry is also vital to the United States (U.S.). It can be found in every region of the country and contributes to the economy and society. The U.S. T/A industry is comprised of suppliers in the cotton, wool, and manmade fiber sectors, yarn and fabric manufacturers, dyes, printers and finishers, the machinery industries, and customers in the U.S. apparel manufacturing industry. According to the reports published by the National Council of Textile Organizations (NCTO) in 2019:
• The U.S. textile industry supply chain, from textile fibers to apparel and other sewn products, employed 594,147 workers in 2018. What’s more, it is estimated by the U.S. government that one textile manufacturing job in this country supports three other jobs.

• In 2018, the U.S. fiber, T/A exports combined were $30.1 billion, and this made the U.S. T/A industry the second largest exporter of textile-related products in the world.

• From 2006 to 2017, the U.S. T/A industry invested $22.8 billion in new plants and equipment. More remarkable, the U.S. manufacturers have opened new facilities throughout the production chain, including recycling facilities to convert textile and other waste to new textile uses and resins recently.

Summary

Overall, the T/A industry has had a decisive influence on global development over time. It is also a dynamic industry, exploring new markets, technologies, and consumer needs under the guidance of international, national, and regional policies, such as the Sustainable Development Goals published by the United Nations. In 2019, one of the crucial trends in this industry identified by McKinsey & Company is addressing sustainability throughout the T/A supply chain (Amed et al., 2019a). Hence, it is essential to have a solid knowledge of the T/A supply chain.

The T/A Supply Chain

A supply chain consists of multiple firms that produce value in products, services, and the ultimate consumers (Mentzer et al., 2001). The T/A supply chain can be divided into four segments: textile production, apparel manufacturing, distribution and sales, and consumption and disposal (Ngai et al., 2014). This supply chain is lengthy and complicated, and other industries are incorporated as well due to the multiple components integrated into apparel. It is becoming
more complex as trends in globalization, customization, and outsourcing for higher profits continue. Based on the work of Gereffi and Memedovic (2003) and Ngai et al. (2014), Table 2.1 shows the main operational processes in each segment.

Table 2.1

The Textile and Apparel Supply Chain

<table>
<thead>
<tr>
<th>Segment</th>
<th>Coding</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textile Production</td>
<td>S1</td>
<td>• Fiber production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fiber-to-yarn</td>
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<tr>
<td></td>
<td></td>
<td>• Yarn-to-fabric</td>
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<td></td>
<td></td>
<td>• Fiber-to-fabric</td>
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<tr>
<td></td>
<td></td>
<td>• Coloring and finishing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transportation</td>
</tr>
<tr>
<td>Apparel Manufacturing</td>
<td>S2</td>
<td>• Product development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mass garment production (cut &amp; sew)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Finishing and packaging</td>
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<tr>
<td></td>
<td></td>
<td>• Transportation</td>
</tr>
<tr>
<td>Distribution &amp; Sales</td>
<td>S3</td>
<td>• Marketing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transportation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wholesaling and retailing</td>
</tr>
<tr>
<td>Product Consumption &amp; Disposal</td>
<td>S4</td>
<td>• Purchase and use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disposal</td>
</tr>
<tr>
<td></td>
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<td>• Transportation</td>
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Textile Production

The first sector, textile production, begins with resource depletion, such as water use in cotton cultivation. Fibers are the fundamental units of all textile products, and they can be categorized in several ways. In one widely used classification method, fibers can be classified into two groups, natural fibers and manmade fibers. Natural fibers are the fibers that grow or exist in nature, such as cotton and wool. In contrast, manmade fibers are the fibers whose chemical composition, structure and properties are modified significantly and intentionally during the manufacturing process.
Manmade fibers are separated into regenerated fibers and synthetic fibers. Regenerated fibers are created by dissolving the cellulose area of plant fiber in chemicals and making it into fiber again, such as rayon. Synthetic fibers are made by polymerizing smaller molecules into larger ones, such as polyester. Chronologically, the use of natural fibers can be traced back to 30,000 BC using animal fibers, such as wool. However, the first manmade fiber, rayon, was generated in the late 19th century, along with the end of the Second Industrial Revolution and the advancement of production technologies (Sinclair, 2014). Although manmade fibers do not have a long history, the demand for manmade fibers, particularly polyester, is snowballing. In 1980, the need for polyester was only 5.2 million tons globally, and by 2000, it had grown to 19.2 million tons (Carmichael, 2015). According to the annual insights report of Textile Exchange in 2018, polyester still occupied the largest market share, followed by cotton, whose market share was about half of polyester.

After fibers are obtained from raw materials, they are processed into spun yarns or filament yarns. There are typically several steps to produce spun yarns, including carding, combining, drawing, and spinning. Filament yarns are composed of continuous filaments aligned in parallel rows, except when they are coiled by the insertion of a twist for special appearance or thickness (Lawrence, 2015). Sequentially, yarns are converted to fabrics through weaving or knitting processes. Fibers are converted to fabrics directly to produce nonwoven fabrics. There are optional processes: coloring and finishing, which can be added after the fiber production, yarn production, or fabric production processes to create customized effects (Ngai et al., 2014). The fabrics produced here can be transported to other mills throughout the world for the next step to get the final textile products, such as apparel.
**Apparel Manufacturing**

The apparel manufacturing segment comprises three main processes: product design and development, mass garment production, and finishing and packaging (Ngai et al., 2014). The product design and development processes highly depend on careful consideration of trends, consumer preferences, and the market environment. Due to the technological advancements of Computer-Aided Design (CAD) systems, 3D scanning, and artificial intelligence, currently, designers can accomplish the design, pattern making, material selection, and sample production processes at a fast speed with high quality (Forza & Vinelli, 2000). When the sample is approved, garments will be mass-produced in cut & sew factories. Compared with other processes, this step is considered more labor-intensive, which is why manufacturing is usually completed in developing countries where labor costs are lower (Nayak & Padhye, 2015). Finally, garment finishing and packing processes are added to ensure the finished products are ready to be shipped.

**Distribution & Sales**

Sequentially, the finished garments are transported from the factories to the designated distribution destinations. There are two main selling processes, wholesaling and retailing, within the distribution channel. Wholesaling involves sales to merchandisers, retailers, and other resellers. However, retailing is to the ultimate consumers (Ngai et al., 2014). Some main functional activities intertwined in the retailing process are marketing, maintaining and controlling the inventory, providing services to consumers, and approaching and developing client bases (Ngai et al., 2014). With the coordination of these activities, products are ready to be purchased by and distributed to consumers.
Product Consumption & Disposal

After the products are purchased, they are also maintained by consumers. Through repeated washing, drying, ironing, and dry-cleaning processes, garments are disposed of when they have served their purposes for the consumers. Several main disposal methods include recycling, landfilling, reselling, and donating (Bianchi & Birtwistle, 2012).
Issues and Sustainable Practices in the Textile and Apparel Industry

Issues

The T/A industry is an indispensable part of daily life and essential for global development, while there are also significant issues related to sustainable development in this industry. The complexity and the long history of the T/A supply chain make the issues broader and more severe (Muthu, 2017). In the “Statement of Research Background” section of the last chapter (Introduction), some environmental issues (i.e., wastewater) and social issues (i.e., safety) have been introduced summarily, and their collateral damage to companies’ images and profits has been conjectured. A more comprehensive understanding of the issues is essential in looking for corresponding sustainable solutions in the future. Hence, in this section, in consideration of the definition of sustainability, issues related to sustainability in this industry are expatiated along with the supply chain in two categories, including environmental issues and social issues (Connell & Kozar, 2012).

Environmental Issues

Environmental issues in the T/A are dynamic. This industry has a long and complicated supply chain consisting of many phases, including resource depletion, fiber, yarn and fabric manufacturing, finishing, apparel assembly, packaging, transportation and distribution, consumer end-use, product recycling, and ultimate disposal (Nagurney & Yu, 2012). Operational processes in each of these phases are likely to cause environmental issues.

Some critical issues in these processes related to water, carbon footprint, and waste have been discovered and explored. However, with fast-changing trends and declining prices, people are consuming more apparel, and correspondingly companies increase their production as much as possible to meet consumer demands (Amed et al., 2019b). As a result, there are more impacts
generated from the identified environmental issues. Besides, with new technology development, some emerging issues, such as microplastic pollution, are discovered by researchers and found associated with the T/A industry. Following some of the severe critical issues are discussed.

**Water.** Water is a major concern in the T/A industry. Some terms, such as water stress, water scarcity, and water risk, have been used to describe water issues. According to World Wildlife Fund’s overview on the global water scarcity issue, water scarcity is mainly caused by water pollution, heavy water consumption (especially in agriculture), and population growth (World Wildlife Fund, 2019). The T/A industry contributes to the first two, water consumption and pollution. In addition to the traditional water pollution caused by toxic substances, recently, the microfiber released by the T/A industry has been found in the ocean and results in water pollution.

**Water Consumption.** Large quantities of water are required throughout the T/A supply chain. Specifically, natural fiber cultivation, dyeing, printing, and washing operations are water-intensive, using up to 200 tons of water per ton of fabric (Li et al., 2018). As one of the most common natural fibers used in apparel, cotton accounts for about 30 percent of all fibers found in textiles. However, cotton production is water intensive. Drew and Yehounme (2017) reported that 2,700 liters of water, which one person drinks in two and a half years, is required to produce the cotton needed to make a single t-shirt.

Also, cotton cultivation in the textile and apparel industry has been linked to Central Asia's environmental devastation. The Aral Sea, which was the world’s fourth-largest lake and fed by two of Central Asia’s mightiest rivers, its eastern basin of the freshwater body was completely dry in August 2014 (Hoskins, 2014). In the 1960s, a massive irrigation network for cotton and wheat was built in Kazakhstan and Uzbekistan, and these plants were irrigated using
the water of the Aral Sea. From the 1960s to 2000, the Aral Sea was reduced to some small lakes due to large quantities of cotton plants. As a result, millions of fish in the sea died, and coastlines receded miles from towns. Most people moved away from their hometown, and those few people who remained were plagued by dust storms that contained the toxic residue of industrial agriculture (Howard, 2014).

**Water Pollution.** Water pollution happens when toxic substances enter water bodies such as lakes, rivers, and oceans. It can be caused in many ways, and two of the most polluting direct sources are city sewage and industrial waste discharge. Indirect water pollution sources include contaminants that enter the water supply from soils or groundwater systems and the atmosphere via rain (World Wildlife Fund, 2019). Due to chemical use throughout its supply chain, severe water pollution is caused by the T/A industry.

In conventional cotton farming, to control the numerous pests feeding on the cotton plants, farmers rely on pesticides’ heavy application. Cotton farming is responsible for 11 percent of pesticide use while only using about 3 percent of the world’s arable land. In developing countries, pesticides used for cotton cultivation account for 50 percent of the pesticides used in agriculture. The hazardous pesticides that remain on the soil surface eventually infiltrate underground or travel through the air and integrated with water, which people use. Exposure to pesticides and the use of polluted water with pesticides remained can contribute to 350,000 farmer deaths and a million hospitalizations a year (Hoskins, 2014).

In addition to the raw material production process, it was estimated that about 20 percent of industrial water pollution is due to T/A manufacturing, primarily through the dyeing and finishing processes (Drew & Yehounme, 2017). High levels of salts, acids, or alkali chemicals, surfactants, and dyes exist in the released wastewater of dyeing (Islam et al., 2014). There are 72
toxic chemicals identified in water solely from textile dyeing, and 30 of them cannot be removed (Kant, 2011). More seriously, these toxic chemicals may affect aquatic life and other species, including humans (Pal, 2017).

**Microplastic Pollution.** Plastic pollution has been recognized for a long time, whereas more recently, another emerging issue that has received increasing attention from the academia, public, and policymakers is microplastic pollution (Van Cauwenberghe et al., 2013). Typically, microplastic refers to a less than 5 mm size particle, and it is considered hazardous to the marine environment and organisms. Like Browne et al. (2007), some researchers have also defined microplastic as particles smaller than 1mm. While the value of 5 mm is more commonly applied, it has been used to describe microfiber.

Microfiber is a subcategory of microplastic, which is thought to be generated from textiles. All fibers can enter the oceanic water and food supply chain. However, synthetic fibers take a long time to degrade and have long-lasting impacts. It was indicated that a typical wash (about 6 kg) of laundry could release more than 700,000 fibers (Napper & Thompson, 2016). Even though washing effluent reaches sewage treatment plants first, microfibers are found in the outgoing effluent, and they will get aquatic and terrestrial systems. Through various identifications, it was addressed by researchers that microfibers were found in multiple food products, including blue mussels, honey, table salt, and beer (Almroth et al., 2018).

**Carbon Footprint.** Carbon footprint is a measurement of the Green House Gases (GHGs) produced by burning fossil fuels for electricity, heat, and transportation. GHGs, which include water vapor, carbon dioxide, methane (CH₄), ozone (O₃), and nitrous oxide (N₂O), naturally present in the atmosphere, trap heat and make the planet warmer (Environmental Protection Agency, 2017). It has been reported that textiles and aluminum generate the highest
GHG emission per unit of material, and the textile industry is indicated as the fifth largest contributor of CO$_2$ emission, producing 1.3 billion tons of CO$_2$ equivalents (CO$_2$e) per year (Kissinger et al., 2013).

Raw materials production in the T/A industry accounts for higher GHGs emissions than other processes (Huang et al., 2017). As identified earlier, polyester is the most frequently used fiber in clothing. The emissions for polyester production are higher as the starting materials are from fossil fuels such as crude oil. In 2015, polyester production for textiles used results in more than 706 billion kg of CO$_2$e (Espinosa, 2019). It was estimated that the production of a single polyester t-shirt results in 5.5 kg CO$_2$e emission, which is equivalent to a passenger car traveling more than 10 miles. A cotton t-shirt, using the same production process, only emitted 2.1 kg CO$_2$e (Espinosa, 2019).

**Waste.** It was estimated there were 92 million tons of textile waste annually generated from the global fashion industry, and the waste was projected to increase by about 60 percent between 2015 and 2030, according to the Pulse of the Fashion Industry Report 2017 (Global Fashion Agenda, 2018). In the U.S., each citizen throws away about 81 pounds of T/A products every year, and out of this waste, 95 percent could have been recycled (Lynn, 2018). A large amount of textile waste indicates resource depletion and also pollution. Once this waste is disposed of in landfills, natural fibers can take hundreds of years to decompose, and they may release methane and CO$_2$ gas into the atmosphere. Additionally, synthetic fibers are designed not to decompose in landfill conditions, and when they do decompose, they may release toxic substances into groundwater and surrounding soil (Lewis et al., 2017).
Social Issues

Social issues in the T/A industry were first formally addressed with the advent of the First Industrial Revolution. Workers’ rights were deprived, and their safety was threatened due to capitalists’ infinite goal for increased production and higher profits. Concerning human being’s rights, Dickson et al. (2009) identified vital social issues in the contemporary T/A industry as forced labor, low wages, excessive hours of work, discrimination, health and safety hazards, psychological and physical abuse, lack of awareness of workers’ rights, and lack of worker representation for negotiations with management. Recently, animal welfare is increasingly recognized to be associated with this industry’s social sustainability, as this industry uses many animal-based materials, and animal cruelty has been criticized (Lundblad & Davies, 2016).

Following is a review of selected issues:

Child Labor. Child labor is a specific issue in this industry since much of the supply chain requires low-skilled labor and some tasks are even better suited to children than adults. For instance, picking cotton can be accomplished better by children since their smaller hands will not easily damage the cotton. Children also work at other stages of the supply chain, such as yarn spinning, dyeing, and apparel manufacturing. It was estimated that 152 million children, including 64 million girls and 88 million boys, were in child labor globally in 2016, accounting for almost one in 10 of all children worldwide (International Labor Organization, 2018). Many of them are involved in the T/A supply chain to perform the related work, such as cotton cultivation and apparel manufacturing, to satisfy the demand of consumers throughout the world (International Labor Organization, 2018).

Low Wages. To reduce labor costs, garment firms in developed countries outsource production to developing countries, while those in developing countries move production within
and between nations to find cheaper labor. Repeatedly, firms in this industry are competing fiercely, and poorer countries are forced to offer the most inexpensive labor. A report from Public Radio International (PRI) indicated that garment workers in many parts of the world earn much less than the national average. Of the 21 countries investigated by PRI, garment workers’ monthly wages ranged from $1,864 in the United States to $194 in Sri Lanka (Newman, 2017). The report also addressed that women were paid less than men, and three-quarters of the workers were women. Kaur (2016) reported that garment workers’ wages were not enough to provide their families with basic human necessities.

**Work Hours.** Usually, workers in the T/A industry work extra hours for two reasons. First, due to the low wages, they have to work for extra hours to earn sufficient money and meet basic needs. Second, they are forced to work for additional hours to satisfy production requirements and meet scheduled delivery. It is not uncommon for workers to work 10 to 12 hours per day and sometimes up to 18 hours. When factories face order deadlines, longer working hours are expected. In some countries, like China, workers were frequently working a seven-day week during peak seasons (Reinhard, 2013).

**Safety.** On November 24, 2012, there was a fire in the Tazreen Fashions factory in Bangladesh, which led to at least 112 workers' deaths. While just five months later, the collapse of the Rana Plaza building in Bangladesh killed 1,134 garment workers and injured hundreds of others (University of Sussex, 2017). More recently, in March 2019, a garment factory fire that injured eight people outside of Dhaka, Bangladesh has cast doubt over the readiness of national inspection bodies to assume the responsibilities of the Accord on Fire and Building Safety in Bangladesh and the Alliance for Bangladesh Worker Safety (Chua, 2019). It is not uncommon to hear some news about deaths and injuries caused by unsafe work conditions in the T/A industry.
In contrast, the effects resulted from these catastrophes are still appalling. Unsecured work conditions threaten workers’ lives, while its consequences are sabotaging brands’ and retailers’ images.

**Health.** As identified earlier, the use of pesticides for cotton cultivation can result in 350,000 farmer deaths and a million hospitalizations a year (Hoskins, 2014). Many chemicals are used in other processes throughout the T/A supply chain, and many are hazardous. Workers in this industry, specifically those who work in the dyeing, printing, or finishing sectors, can be exposed to dangerous chemicals. They work with solvents and fixatives, crease-resistance agents that release formaldehyde, flame retardants with toxic compounds, and antimicrobial agents. Exposure to formaldehyde has been linked to various types of cancer, including thyroid, nasal, stomach, and esophageal cancers. Many azo dyes and their reductively cleaved products negatively affect human health, like causing allergies (Chung, 2016). Although few studies have been conducted directly linking chemicals in clothing to human health issues, the chemicals often found in apparel production have been indirectly linked to neurotoxicity, liver, kidney, lung disorders, cancer, and more (Women’s Voices, 2018).

**Animals.** This industry has used animal-based materials, such as leather and wool, for years, and every year billions of animals suffer and die. Skin is torn from them to make leather, and birds and ducks are held down while feathers and downs are ripped out of their sensitive (Lim et al., 2018). Leather is one of the most frequently used animal-based materials in this industry. The majority of the world’s leather comes from India and China, which have limited welfare legislation. Moreover, even in developed nations such as Australia, there is no legal protection for pets as animals raised for leather (People for the Ethical Treatment of Animals, 2020).
**Sustainable Development Goals (SDGs)**

The T/A industry is interconnected with environmental, social, and economic issues. As a significant contributor to global wastewater, carbon emissions, microplastic pollution, poor working conditions, low wages, and child labor, this industry has been denounced by its consumers, workers, and the United Nations (UN). Embedding sustainability in this industry is imperative to maintain companies’ long-term images and profits or associate with sustained global economic development. Recently, with UN SDGs’ publication, companies in this industry, such as VF Corporation, H&M, and Nike, are working to incorporate SDGs into their business plans and operation processes. SDGs are recognized as a framework that can be used to drive T/A business values while identifying a transformative set of sustainability, economic, and social targets.

SDGs are a collection of 17 global goals (Figure 2.2), with an overall aim to end poverty, take care of and protect the environment, and ensure international prosperity for all people as part of a new sustainable development agenda. Each ambitious goal has specific targets to be achieved by 2030, with clear indicators to assess the progress at regular intervals. The United Nations Alliance for Sustainable Fashion, an initiative of UN agencies and allied organizations, was officially launched in 2019 to help achieve SDGs in the T/A sector. This Alliance supports coordination between the UN bodies working in fashion and promoting projects and policies that ensure that the fashion value chain contributes to achieving the SDGs’ targets.
### Figure 2.2

**Sustainable Development Goals (United Nations, 2019)**

<table>
<thead>
<tr>
<th>Icon &amp; Content</th>
<th>Icon &amp; Content</th>
<th>Icon &amp; Content</th>
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<tr>
<td><strong>1 NO POVERTY</strong>&lt;br&gt;End poverty in all its forms everywhere.</td>
<td><strong>2 ZERO HUNGER</strong>&lt;br&gt;End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.</td>
<td><strong>3 GOOD HEALTH AND WELL-BEING</strong>&lt;br&gt;Ensure healthy lives and promote well-being for all at all ages.</td>
</tr>
<tr>
<td><strong>4 QUALITY EDUCATION</strong>&lt;br&gt;Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.</td>
<td><strong>5 GENDER EQUALITY</strong>&lt;br&gt;Achieve gender equality and empower all women and girls.</td>
<td><strong>6 CLEAN WATER AND SANITATION</strong>&lt;br&gt;Ensure availability and sustainable management of water and sanitation for all.</td>
</tr>
<tr>
<td><strong>7 AFFORDABLE AND CLEAN ENERGY</strong>&lt;br&gt;Ensure access to affordable, reliable, sustainable, and modern energy for all.</td>
<td><strong>8 DECENT WORK AND ECONOMIC GROWTH</strong>&lt;br&gt;Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.</td>
<td><strong>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</strong>&lt;br&gt;Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.</td>
</tr>
<tr>
<td><strong>10 REDUCED INEQUALITIES</strong>&lt;br&gt;Reduce inequality within and among countries.</td>
<td><strong>11 SUSTAINABLE CITIES AND COMMUNITIES</strong>&lt;br&gt;Make cities and human settlements inclusive, safe, resilient, and sustainable.</td>
<td><strong>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</strong>&lt;br&gt;Ensure sustainable consumption and production patterns.</td>
</tr>
<tr>
<td><strong>13 CLIMATE ACTION</strong>&lt;br&gt;Take urgent action to combat climate change and its impacts.</td>
<td><strong>14 LIFE BELOW WATER</strong>&lt;br&gt;Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.</td>
<td><strong>15 LIFE ON LAND</strong>&lt;br&gt;Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.</td>
</tr>
<tr>
<td><strong>16 PEACE, JUSTICE AND STRONG INSTITUTIONS</strong>&lt;br&gt;Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.</td>
<td><strong>17 PARTNERSHIPS FOR THE GOALS</strong>&lt;br&gt;Strengthen the means of implementation and revitalize the global partnership for sustainable development.</td>
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The Environmental Dimension

Most of the 17 SDGs can be highly correlated with the T/A industry. Concerning the environmental dimension, targets under SDGs 6, 7, 13, 14, and 15 are directly related to this industry.

SDG 6 (clean water and sanitation) aims at ensuring the safety, accessibility, and affordability of universal drinking water. This can be linked to the use of water and chemicals in the T/A industry. A large amount of water is consumed by this industry, and there are many chemicals used throughout its supply chain. Some toxic chemicals are discharged, especially from the dyeing and finishing process. This goal can be promoted by improving water use efficiency and controlling the use of hazardous chemicals. For example, the restricted substance list and the manufacturing restricted substance list are developed to prevent the use of hazardous substances. New cotton production methods and water-saving dyeing processes are designed to improve water use efficiency.

SDG 7 (affordable and clean energy) targets improving energy productivity and ensuring energy for all. In the T/A industry, most power is generated by burning fossil fuels, emitting many air pollutants, such as sulfur dioxide. Every stage of the T/A supply chain is energy-intensive, from fiber production to transporting and selling clothes to consumers. Even though H&M, Marks & Spencer, Burberry, and Nike have committed to using 100% renewable energy in the future, there were not many other T/A companies found committing to using renewable energy. Hence, the energy issue is still highly related to this industry, and SDG 7 can be alleviated by generalizing the use of alternative renewable energy, such as solar, wind, and thermal power (Muneer et al., 2006).
SDG 13 (climate action) aims to mobilize $100 billion annually by 2020 to address developing countries’ needs to adapt to climate change and invest in low-carbon development. This goal is highly related to the T/A industry. On the one hand, climate change affects the growth and production of natural fibers. On the other hand, as identified earlier, this industry is indicated as the fifth largest contributor of CO₂ emission, producing 1.3 billion tons of CO₂ equivalents (CO₂e) per year. T/A production generates more GHGs than all international flights and maritime shipping combined (United Nations Economic Commission for Europe, 2018). And water consumption and pollution in this industry can also contribute to climate change.

SDG 14 (life below water) targets sustainably managing and protecting marine and coastal ecosystems from pollution. This goal is similar to SDG 6 (clean water and sanitation). However, SDG 14 emphasizes the protection of life below water, and SDG 6 emphasizes the water scarcity issues related to human beings. In addition to controlling the use and release of hazardous chemicals throughout the T/A supply chain, restricting the release of microfibers into oceans should be concerned to assist with the achievement of SDG 14.

SDG 15 (life on land) stresses to take urgent action to reduce the loss of natural habitats and biodiversity, which can further support global food and water security. This is highly relevant to water pollution and depletion of resources throughout the T/A supply chain. For example, cotton requires large amounts of water for irrigation, which causes soil salinization, particularly in dry areas, and soil degradation.

The Social Dimension

The social dimension of the T/A industry is directly linked to SDGs 5, 10, and 11, and indirectly linked to SDG 1 (no poverty), SDG 2 (zero hunger), and SDG 3 (good health and well-being). SDG 5 (gender equality) aims to give women equal rights, land and property, sexual and
reproductive health, technology, and the internet. As identified earlier, about three-quarters of the workers are women in this industry, and their wages are lower than men doing similar tasks.

SDG 10 (reduced inequalities) calls for global solutions to income inequalities. Wages of workers in the T/A industry are less than national averages and are insufficient to support workers and their families’ basic needs. Specifically, workers in the developing countries receive the lowest wage, have the most extended work hours, and poor working conditions.

SDG 11 (sustainable cities and communities) is designed to create career and business opportunities, safe and affordable housing, and building resilient societies and economies. As estimated by the UN Alliance for Sustainable Fashion, the T/A industry employs 75 million people worldwide. If this industry can maintain a sustained development and effectively manage labor issues, it should provide strong support for the implementation of SDG 11.

SDG 8 and SDG 12 are related to both environmental and social dimensions. SDG 8 (decent work and economic growth) promotes sustained economic growth, higher productivity levels, and technological innovation. A combination of rapid advancements in T/A technologies and the management of workers can facilitate the achievement of SDG 8.

SDG 12 (responsible consumption and production) is structured to efficiently manage shared natural resources, confined disposal of toxic waste and pollutants, and recycling and reducing waste from businesses and consumers. Changing the T/A industry produces products is essential for creating more efficient production and shifting toward a more resource-efficient economy. For example, by using waterless dyeing technology, water efficiency can be improved, and by recycling T/A waste, depletion of resources can be reduced. For the consumers, communication between companies and consumers is vital to promote their responsible consumption and to minimize waste from consumers.
Sustainable Practices

According to the SDGs, T/A companies have made adjustments to their business plans and developed sustainable practices throughout their supply chains. Apparel is an essential carrier of companies’ practices toward sustainability and an indispensable connector between retailers and consumers. Sustainable apparel is produced under environmentally or socially sustainable practices (Kang & Kim, 2013; Kim & Damhorst, 1998; Kozar & Connell, 2013). For instance, sustainable apparel can be made from recycled or organic materials, such as recycled polyester and organic cotton.

Specifically, the apparel produced under environmentally sustainable practices is environmentally sustainable apparel (ESA), and the apparel produced under socially sustainable practices is socially sustainable apparel (SSA). Considering the T/A supply chain, sustainable issues in this industry, and SDGs, some representative practices that can be found in the T/A market are introduced in the following sections of environmental practices and social practices. At last, the tools used to assess environmental and social practices are presented.

Environmental Practices

Raw Materials. Cotton and polyester fibers are extensively used in T/A products, and some commitments to sourcing sustainable cotton and polyester can be found in many companies’ reports, such as Nike. Hence, sustainable practices regarding these two fibers are introduced.

Cotton. Cotton is the most frequently used natural fiber in T/A products. Conventional cotton farming encompasses large numbers of environmental and social issues. Cotton is one of the most chemical-intensive crops to grow, accounting for just 2.5% of farmland worldwide, contributing 25% of all fertilizer use and 10% chemical pesticide use (Pal, 2017). Furthermore,
cotton production consumes vast water quantities, often in places that can least afford it due to water risk concerns. Three kinds of sustainable cotton, including organic cotton, Better Cotton, and recycled cotton, have been developed and widely disseminated to reduce the harmful effects of conventional cotton cultivation (Cotton Works, 2019).

Organic cotton is the cotton that is produced and certified to organic agricultural standards. Its production can sustain the health of soils, ecosystems, and people by using natural processes rather than artificial inputs. Also, organic cotton farming does not allow the use of toxic chemicals or GMOs (genetically modified organisms) and uses 71% less water and 62% less energy compared with conventional production (“Find out,” 2019). Textile Exchange’s 2018 Organic Cotton Market Report identified organic cotton grown in more than 20 countries worldwide (Textile Exchange, 2019). Although global organic cotton production still occupied less than 1% of global cotton production in 2018, organic cotton production increased 10% over the prior year, 2017.

Better Cotton is the cotton certified by the Better Cotton Initiative (BCI). BCI is a non-profit organization that brings together different T/A supply chain sectors, such as farmers, ginners, traders, spinners, and mills, to promote better cotton farming standards and practices. As of 2017, Better Cotton accounted for 14% of global cotton production, and BCI has a goal for 2020 - Better Cotton accounting for 30% of global cotton production. BCI provides farmers with training on efficiently using water, caring for the soil’s health and natural habitats, minimizing the impact of harmful crop protection practices, preserving fiber quality, applying fair work principles, and reducing the use of fertilizers. For example, it was reported that compared to traditional cotton farming, BCI farmers in Pakistan used 40% less water. The first harvest of a
BCI project in India reported an 80% reduction in pesticides and cut water usage by half (Confino, 2011).

Recycled cotton is recognized as the cotton fiber converted from yarns, fabrics, or other textile products and can be reused in textile products. Cotton recycling is generated from two primary sources, including pre-consumer and post-consumer wastes. Since post-consumer waste is challenging to sort due to various color shades and fabric blends, most recycled cotton is produced through pre-consumer waste, such as cutting scraps from apparel manufacturing. The use of recycled cotton can significantly reduce water and energy consumption, resource depletion, and reduce landfill waste and space. It has been reported that compared to a t-shirt made of 100 percent virgin cotton, one t-shirt containing 52 percent recycled cotton can save up to 2,700 liters of water. According to the Higg Materials Sustainability Index, recycled cotton fiber is much more sustainable than organic cotton (Smits, 2018).

These three kinds of sustainable cotton, organic, BCI, and recycled cotton, have been widely accepted by the major companies in the T/A industry. Companies have made commitments to source more sustainable cotton. Table 2.2 shows the companies specifying commitments on sourcing sustainable cotton and their target years by reviewing some industry leaders’ sustainability reports and websites.

**Table 2.2**

*Companies’ Commitments to Source Sustainable Cotton*

<table>
<thead>
<tr>
<th>Goal</th>
<th>Company</th>
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<tbody>
<tr>
<td>2021</td>
<td>Gap Inc.</td>
</tr>
<tr>
<td>2022</td>
<td>Target Corp.</td>
</tr>
<tr>
<td>2025</td>
<td>Asics, ASOS, Kontoor, PVH, Ralph Lauren, VF Corp., Walmart, Zara</td>
</tr>
</tbody>
</table>
Except for Eileen Fisher (2019), whose commitment is sourcing 100% organic cotton, all the companies in “2020” (Levi Strauss & Co., Nike, H&M, and C&A) commit to sourcing 100% sustainable (organic, BCI, and recycled) cotton by 2020 (C&A, 2019; H&M Group, 2019; Levi Strauss & Co., 2019; Nike, 2019). Gap Inc. (2019) commits to sourcing 100% sustainable cotton by 2021; Target Corp. (2019) has committed to sourcing 100% sustainable cotton for their private brand and exclusive national brand products by 2022. All the companies in the last row commit to achieving 100% sustainable cotton sourcing by 2025. In addition to organic cotton, better cotton, and recycled cotton, cotton grown in the U.S. or Australia is also regarded as sustainable cotton by VF Corp., Ralph Lauren, and ASOS.

**Polyester.** Polyester is the most widely used fiber in the T/A industry. It is produced from polymer solutions obtained from nonrenewable petroleum resources (Chen & Burns, 2006). Hence, polyester production is responsible for some environmental issues, such as GHGs emissions and energy consumption. One of the best methods to reduce these environmental impacts is using recycled polyester (rPET).

There are two major polyester recycling methods, mechanical recycling, which is widely used currently, and chemical recycling. A typical mechanical recycling process consists of four main steps from waste sourcing to yarn processing (REPREVE®, 2019):

- **Source Recycled Waste:** Recycled plastic bottles or post-industrial are collected.
- **Make the Chip:** Waste material is chopped, ground, washed, melted, and reformulated into chips.
- **Form the Fiber:** Chip is melted into the liquid polymer and extruded through tiny openings in a spinneret, creating continuous filaments to form fibers.
- **Process the Yarn:** Fibers become yarns through spinning and air-jet texturing.
The chemical recycling process involves using chemicals to depolymerize polyester fibers into original monomers, then polymerize them into new materials. Specifically, polyethylene terephthalate (PET) polymer is returned into ethylene glycol and terephthalic acid monomers using chemical reactions (Carta et al., 2003). Once polymerized back into PET resin, the resulting product is indistinguishable from virgin polyester. Chemical recycling makes it possible to take back T/A products and break them down into fiber components to spin into yarns. However, chemical recycling has had limited adoption due to its high cost, limited capacity, and the low cost to produce virgin polyester (Joo & Oh, 2019).

Since most polyester is recycled using the mechanical method, the primary resource of rPET is PET bottles and containers disposed of by consumers. According to the estimation of Unify, the producer of REPREVE® recycled polyester fibers, five to six soda bottles (16.9 oz.) yield enough fibers for one 50% polyester / 50% cotton blended t-shirt (REPREVE®, 2019). Using rPET instead of new raw materials to produce polyester fibers can significantly reduce the use of energy and generation of GHGs. By September 2019, Unify had recycled more than 14 billion plastic bottles and improved air quality by avoiding 385 million kilograms of CO2 emissions.

In 2017, the non-profit organization, Textile Exchange, challenged over 50 textile, apparel, and retail companies, including industry leaders like Adidas and H&M, to increase their use of rPET by 25 percent by 2020, and forecasted 20 percent of all polyester to be recycled by 2030 (Textile Exchange, 2017a). Companies displayed in Table 2.3 are the companies that have set specific goals related to rPET in their most recent sustainability reports.
Table 2.3

Companies’ Commitments to Source Recycled Polyester

<table>
<thead>
<tr>
<th>Company</th>
<th>Commitment</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF</td>
<td>50% of recycled materials</td>
<td>2025</td>
</tr>
<tr>
<td>Walmart</td>
<td>50% of recycled materials</td>
<td>2025</td>
</tr>
<tr>
<td>Ralph Lauren</td>
<td>100% recycled materials</td>
<td>2025</td>
</tr>
<tr>
<td>ZARA</td>
<td>100% recycled polyester</td>
<td>2025</td>
</tr>
<tr>
<td>Asics</td>
<td>100% recycled materials</td>
<td>2030</td>
</tr>
</tbody>
</table>

Companies within the industry are making efforts to use more rPET. However, there is one primary quantity problem existing related to the recycling and converting of PET bottles. In 2018, global PET production was estimated at 79.3 million tons, of which 55.5 million tons were used in fiber applications (nonwoven industrial end-uses to automotive, home, and apparel textiles). In comparison, the global collection of PET bottles was only 12.8 million tons. Moreover, after converting used PET bottles, approximately only 10.6 million tons were usable flakes. About 56 percent (5.9 tons) of the useable flakes were used in fiber applications (Joo & Oh, 2019). In contrast, demands for polyester fibers in T/A applications reached 46.1 million tons in 2014 (Carmichael, 2014).

If recycling and converting issues cannot be addressed, it will be difficult for the T/A industry to promote rPET widely. Another challenge related to polyester recycling is the quality of T/A products made of rPET. Many factors can influence the quality, such as the original quality of recycled materials, recycling methods, and blend ratios. (Byung-Wan et al., 2006; Útebay et al., 2019).

**Dyeing & Chemicals.** Companies are looking for sustainable dyeing methods (i.e., supercritical carbon dioxide (SC-CO₂) dyeing and foam dyeing) to alleviate the water consumption and pollution issues in the T/A industry. They are also controlling the use of
chemicals, such as eliminating the use of chemicals on the restricted substance list (RSL) and manufacturing restricted substances list (MRSL).

**SC-CO$_2$ Dyeing.** SC-CO$_2$ is a fluid state of CO$_2$ and is a critical manufacturing solvent due to its role in chemical extraction, low toxicity, and environmental impact (Hendrix, 2001). SC-CO$_2$ dyeing is usually used to dye polyester fabrics and has already been embraced by major brands such as Ikea, Adidas, and Nike.

During a typical SC-CO$_2$ dyeing process, liquid CO$_2$ is released into the machine’s dye vessels, where heat and pressure transform the liquid CO$_2$ into a supercritical fluid state. The CO$_2$ in the supercritical fluid state is used to dye fabrics. Heat and pressure are then reduced, and the CO$_2$ exits in the dye vessels as gases. In this process, 95% CO$_2$ is recovered and stored as liquid ready for reuse, which results in SC-CO$_2$ being a sustainable technology. The advantages of the SC-CO$_2$ process include no processing water or auxiliary dye chemicals required, approximately a 50 percent reduction in energy consumption, and less processing time than conventional textile dyeing methods (Hasanbeigi & Price, 2015).

DyeCoo is widely accepted as the first company to unveil commercial SC-CO$_2$ dyeing machines. In partnership with DyeCoo, Nike has started using its first water-free facility, cooperating with its Taiwanese contract manufacturer Far Eastern New Century to eliminate water use and auxiliary chemicals in fabric dyeing. The SC-CO$_2$ dyeing process, named as ColorDry by Nike, reduces dyeing time by 40 percent, energy use by about 60 percent, and the required factory footprint by 25 percent compared to traditional dyeing methods (Korosec, 2013). However, currently, DyeCoo’s technology is only widely applied to polyester. Nike and DyeCoo are still developing processes for dyeing materials made from other fibers, such as cotton.
**Foam Dyeing.** Foam dyeing is an attractive alternative to traditional dyeing methods due to its potential environmental and economic benefits (Kumar & Yaashikaa, 2018). In the form processing, chemicals are formulated with a foaming agent in a concentrated dispersion. The formulation is mechanically foamed, increasing its volume five to twenty folds. Resultant foam is applied as a coating to the fabric. The fabric is then passed through squeeze rolls, which collapse the foam and distribute the chemicals uniformly through the fabric. The fabric then enters a steamer and drying oven to fix the dye. Compared to conventional dyeing methods, foam dyeing has some advantages, including 1) a reduction in water and energy use, auxiliary chemicals, and processing time; 2) capability to be applied on all kinds of fabric blends and compositions; and 3) ease of being combined with hand processes, laser and ozone garment treatments (Cotton Works, 2018).

**RSL & MRSL.** The Restricted Substance List (RSL) is a list of hazardous chemicals restricted below a certain threshold in finished textile products (AAFA, 2019). The Manufacturing Restricted Substance List (MRSL) is a list of hazardous substances restricted below a certain threshold in textile, apparel, and footwear manufacturing (ZDHC, 2019). This list includes process chemicals, which may be used in manufacturing but are not present in the finished product. These two lists are developed to control chemical use throughout the T/A supply chain and reduce pollution caused by chemicals.

RSL was developed to provide apparel and footwear companies with information related to regulations and laws that restrict or ban certain chemicals and substances in finished home textile, apparel, and footwear products worldwide. The American Apparel & Footwear Association (AAFA) released the first edition of RSL in 2007 and updated the 20th edition in 2019. The RSL is updated regularly to reflect international regulation modifications. In the RSL,
there are 12 categories with more than 250 chemicals. For each substance, the RSL discloses the chemical name and color index name, the restriction or maximum limit on the final product or tested component, the regulation, the test method, and the countries that maintain equal or fewer restrictions (Scarano, 2018).

Based on the AAFA RSL, some additional RSLs have been developed by specific companies, such as H&M RSL, Levi Strauss & Co RSL, Nike RSL, Benetton RSL, and VF Corp. RSL. Another RSL, known as AFIRM RSL, is developed by the AFIRM Group, a group of more than thirty brands, including Puma, Lacoste, Gap Inc., and Adidas.

MRSL was first released by the Zero Discharge of Hazardous Chemicals (ZDHC) in 2014 to help brands, their supply chains, and the industry adopt a harmonized approach to the control of hazardous substances. There are about 150 hazardous substances covered in the MRSL, including cleaners, solvents, adhesives, stabilizers, paints, inks, detergents, dyes, pigments, auxiliaries, coating and finishing agents used for wet-processing, maintenance, wastewater treatment, sanitation, and pest control (Velasquez, 2014). Unlike the substances in the RSL, these substances in the MRSL are potentially used and discharged into the environment during the manufacturing process, not just substances that could be present in finished products.

**Waste Management.** With the steadily increasing global demands for T/A products and growing attention to environmental responsibility regarding solid waste management, the T/A industry has expanded its efforts to reduce the disposal of pre-and post-consumer textile waste in landfills. There are three main methods used in the market to prolong the life of textile products and tackle landfill challenges, including repair, reuse, and recycling. Additional benefits of these three methods include reducing resource depletion, avoiding the use of virgin fibers, reducing energy and water consumption, and reducing pollution.
**Repair.** Textile repair is a direct way to prolong the life of products. Some companies, such as Patagonia, offer product care guidelines to consumers to help ensure their products last as long as possible. Whereas, if an item from Patagonia does happen to break or tear, consumers are encouraged to follow repair instructions online and mend the product. Alternatively, they can bring it back to a Patagonia store where staff members can fix it or send it off to their garment repair facility. Most recently, REI and Eileen Fisher are also receiving, repairing, and pricing their take-back products. These fixed products can be found on the companies’ websites, or in the case of Eileen Fisher, more Eileen Fisher Renew items are finding space in the company’s stores (Danziger, 2019).

**Reuse.** Textile reuse is another way toward the longer service life of textile products. Specifically, this can be done through renting, trading, swapping, borrowing, and inheriting. Reused T/A products can be facilitated by secondhand shops, flea markets, garage sales, online marketplaces, charities, and clothing libraries (Sandin & Peters, 2018). For example, the secondhand apparel market is growing with more secondhand shoppers and secondhand marketplaces, such as thredUP and the RealReal. In 2018, the total secondhand apparel market was $24 billion, which was expected to double in five years (Reinhart, 2019).

**Recycle.** If the products are beyond repair or reuse, they can still be recycled and used in new textile or non-textile products. This is one of the two textile recycling methods, which is known as post-consumer recycling. Another textile recycling method is pre-consumer recycling, including recycling scraps created as by-products from yarn and fabric manufacturing. Companies are on the path toward textile recycling and producing new fibers with recycled materials. For example, in 2017, Lenzing Group, a fiber innovation company, produced its Tencel fiber contained cotton scraps derived from cutting operations and wood (Scaran, 2017).
Social Practices

Codes of Conduct. A code of conduct is a set of rules that guide and orient behavior within an organization or sector to promote social behavior (Hassel, 2008). According to the Business Social Compliance Initiative (BSCI), many companies and associations have created codes of conduct and monitoring systems to deal with different social issues, such as working conditions, within the supply chain and ensure specific standards rules are kept.

On April 14, 1997, U.S. President Clinton announced the Apparel Industry Partnership Agreement (AIPA) (Clinton, 1997). Some high-profile companies like Nike Inc., Reebok International Ltd., and Liz Claiborne Inc. were among the ten initial signatories. This agreement was a model workplace code of conduct that companies and their contractors in the apparel industry would voluntarily adopt. According to the analysis of Emmelhainz and Adams (1999), this code of conduct contained in the AIPA included the following essential rules:

- Prohibitions on the use of child labor
- Elimination of worker abuse, harassment, and discrimination
- Recognition of worker rights of freedom of association and collective bargaining
- A requirement that workers be paid either the legal minimum or prevailing industry wage, whichever is higher
- A maximum workweek of 60 hours and a mandatory cap on overtime
- A safe and healthy job site environment

The AIPA covered many social issues in the T/A industry. Currently, companies in this industry have developed their codes of conduct. Typically, companies’ core agreements in codes of conduct are based on AIPA and the eight fundamental conventions of the International Labor Organization (ILO). The eight items are the Freedom of Association and Protection of the Right
to Organize Convention, Right to Organize and Collective Bargaining Convention, Forced Labor Convention, Abolition of Forced Labor Convention, Minimum Age Convention, Worst Forms of Child Labor Convention, Equal Remuneration Convention, and Discrimination (Employment and Occupation) Convention (Yu, 2008).

Voluntarily adoption of codes of conduct in the T/A industry is a response to consumer campaigns. With the increasing fear of consumers’ rejection of products made under poor conditions and unfair labor practices, some major companies, such as Levi Strauss &Co., Reebok, and later Nike, decided to address the labor standard problems and conduct regular supervision (Hassel, 2008). Today, with the sustainable development in this industry, more and more firms commit to ensuring consistent application of labor norms to workers and requiring their suppliers to follow the same rules.

**Fair Trade.** “Offering Fair Trade products is an important new tool to help ensure fair wages and workplace safety for the workers in the supply chain who sew Patagonia clothes,” said Cara Chacon, Director of Social and Environmental Responsibility for Patagonia (Elks, 2013). With the increasing environmental movement and fair labor movement worldwide, consumers’ demands for ethically made products is growing. Correspondingly, textile manufacturers, retailers, and organizations are making efforts to implement fair trade (Dissanayake et al., 2017).

Fair trade involves a marketing system that concatenates workers’ needs for income and work conditions, retailers’ goals for transforming trade, and consumers’ concerns for social responsibility through a compatible, nonexploitative, and humanizing system of international exchange (Halepete et al., 2009). A fair-trade brand or a fair-trade product is a brand or product
that meets specific standards and has been certified and labeled by a typical independent organization, such as “Fair Trade Certified.”

**Tools**

**Higg Index.** In 2009, Patagonia and Walmart formed the Sustainable Apparel Coalition (SAC), a nonprofit industry association dedicated to collective solutions for reducing the environmental and social footprint of the apparel and footwear industries. The SAC’s primary focus is building the Higg Index, a suite of standardized measurement tools that enable brands, retailers, and facilities of all sizes to accurately measure and score a company or product’s sustainability performance. There are currently three Higg Index tools, including Higg Product Tool, Higg Facility Tool, and Higg Brand & Retail Tool. In 2019, Higg was spun out of the SAC as a public-benefit technology company.

**Higg Product Tool.** The Higg Product Tool is a set of indices and modules that can be applied during a product’s design phase to understand its predicted environmental impact. It can also be used when a product is completed for a more accurate impact calculation. It involves Higg Materials Sustainability Index (MSI), Higg Design & Development Module (DDM), and Higg Product Module (PM). Designers, brands, retailers, and manufacturers can use the information provided by Higg Product Tools to make better choices on materials and production techniques at each stage of a product’s development process (Higg Product Tools, 2019).

**Higg Facility Tool.** The Higg Facility Tool is comprised of the Higg Facility Environmental and the Social & Labor Module. It is used to measure impacts at individual factories rather than the parent company as a whole. If users want to verify their facilities, they must conduct the assessments at least once a year, and Sustainable Apparel Coalition then verifies these assessments approved assessors. The Higg Facility Tools creates opportunities for
open conversation among value chain partners, so businesses at every tier in the value chain collectively perform better (Higg Facility Tools, 2019).

**Higg Brand & Retail Tool.** The Higg Brand & Retail Module can be applied by any business to measure their operations’ environmental and social impacts and make meaningful improvements. Further, it allows companies to evaluate their benchmark against their peers and identify opportunities to demonstrate leadership. Like the Higg Facility Tools, this tool can also be used to share sustainability information with key stakeholders, including supply chain partners and consumers (Higg Brand & Retail Module, 2019).

**Zero Discharge of Hazardous Chemicals.** Zero Discharge of Hazardous Chemicals (ZDHC) Foundation, established in 2011, is a group of apparel and footwear brands, chemical suppliers, manufacturers, and other organizations working together to lead the industry toward zero discharge of hazardous chemicals by 2020. The MRSL is an essential component of chemical management developed by the ZDHC Foundation. To assist with the use of the list, ZDHC Foundation has also developed a platform, ZDHC Gateway.

**ZDHC Gateway.** The ZDHC Gateway - Chemical Module is an online platform that helps register and find chemicals that conform to the ZDHC MRSL. With the tools and facilitates, this platform provides information that can be exchanged between brands, suppliers, and chemical formulators. Brands can engage their suppliers and communicate their requirements for safer chemistry. Suppliers can access their customers’ requirements. Chemical companies throughout the world can register themselves and their products on the platform. With the participation of brands, suppliers, and chemical companies, visibility over the chemicals being used throughout the industry will be increased.
The Sustainability Consortium. The Sustainability Consortium (TSC) is a global non-profit organization working to transform the consumer goods industry by partnering with leading companies to define, develop, and deliver more sustainable products. They have diverse members and partners, including manufacturers, retailers, suppliers, service providers, NGOs, civil society organizations, governmental agencies, and academics. Their mission is to work collaboratively with their stakeholders to build science-based decision tools and solutions that address vital sustainability issues throughout a product’s supply chain and lifecycle. One of their tools designed to be used by the T/A industry is the TSC Wastewater 101 Toolbox.

Wastewater 101 Toolbox. The purpose of this Toolbox is to help stakeholders in the T/A industry learn about the causes, impact, and treatment of wastewater. This Toolbox is created through a TSC-member task force of leaders in the textile industry that include Hanes Brands, Fruit of the Loom, Walmart, NC State, Cotton Inc., and the U.S. Department of Energy. It is a free online resource that will help manufacturers, retailers, and brands improve their wastewater footprint and help the producers of textiles have a lesser effect on people and the planet’s resources.
Textile and Apparel Consumer Behavior and Consumer Knowledge

Consumers

There are two main marketing strategies in the T/A industry, including push marketing and pull marketing. Push marketing (product first) is defined as a product initially developed by the company and then marketed to consumers. For example, companies introduce products that consumers do not know or realize they need. Pull marketing (market first) is defined as a product that is developed based on consumer needs. For example, companies learn about current markets’ needs or trends and then develop or enhance a product. It was found that textile companies (i.e., fiber and yarn production) were more likely to use push marketing, and apparel companies (i.e., sewn goods) were more likely to use pull marketing (Parrish et al., 2004). Pull marketing is highly related to consumers in the T/A industry.

Moreover, with the development of the internet and widespread social media use started in the early 2000s, pull marketing has been more critical to this industry. Hence, the T/A industry has been identified as a highly consumer-driven industry (Desore & Narula, 2018; Dickson, 2000). Many issues and challenges are also related to consumers, such as the increasing textile consumption and textile wastes. Hence, the implementation of sustainable development in this industry should rely on the industry itself and consumers. It is vital to have insights regarding consumers and their behavior.

In this section, literature related to consumer behavior is reviewed, and the theory which has been widely applied to analyze consumer behavior and consumer knowledge is introduced. There are three primary focuses: 1) the theory of planned behavior, which has been expanded and used to understand and analyze consumer behavior; 2) an introduction of consumer knowledge; and 3) the relationship between planned behavior and consumer knowledge.
Consumer Behavior

The Theory of Planned Behavior and Reasoned Action

The theory of planned behavior (TPB) was first proposed by Ajzen in 1985. The TPB is an extension of the theory of reasoned action (TRA). In the TRA (Figure 2.3) framework, there are two variables, attitude toward behavior and subjective norm. Together, they lead to the formation of a ‘behavioral intention,’ which influences the actual behavior (Fishbein & Ajzen, 1975).

Attitude toward behavior refers to the degree of a person’s favorable or unfavorable evaluation of the behavior in question (Fishbein & Ajzen, 1975). When the evaluation of the outcomes is positive, the more favorable the attitude toward this person’s behavior, the more possible he or she will perform this specific behavior. Subjective norm is defined as ‘perceived social pressure to perform or not perform the behavior’ (Ajzen, 1985). It is the opinion of others who are essential to an individual. This individual’s decision-making process can be influenced by the opinion. As a result, he or she will be more or less likely to perform the behavior (Conner & Armitage, 1998).

Figure 2.3

The Theory of Reasoned Action (adapted from Fishbein & Ajzen, 1975)
In the TPB (Figure 2.4) framework, perceived behavioral control (PBC) is included as an exogenous variable that has both an indirect effect on behavior and a direct effect on behavior through intentions (Ajzen, 1985). The PBC is an individual’s perceived ease or difficulty to perform the particular behavior; in other words, the more resources and opportunities an individual thinks he or she possesses, the greater his or her perceived behavioral control is (Ajzen, 1985). Madden et al. (1992) compared the TRA and TPB, and their results indicated that the inclusion of perceived behavioral control enhanced the prediction of behavioral intention and behavior.

Furthermore, research on the TPB has made considerable progress since the theory was introduced in 1985. Researchers who applied the TPB in their studies also included additional factors to broaden and enhance the existing model of planned behavior. This was consistent with the statement: ‘The theory of planned behavior is, in principle, open to inclusion of additional predictors if it can be shown that they capture a significant portion of the variance in intention or behavior after the theory’s current variables have been taken into account (Ajzen, 1991).’
The original TPB and extended TPB models have been widely used in the research related to sustainable T/A (Chen & Chai, 2010; Han & Chung, 2014; Han, 2018; Kang & Kim, 2013; Kang et al., 2013; Zheng & Chi, 2015). However, in these studies, each variable (attitude, subjective norm, and PBC)’s weights and significance varied. In general, the factor, attitude, was regarded as a prominent role influencing consumers’ behavior and decision-making (Nam et al., 2017). Thereby, some research results related to attitudes’ effects are reviewed and presented in the next section.

**Attitudes**

In 2013, Kang et al. surveyed more than 700 students attending large universities in the U.S., South Korea, and China. They employed an extended TPB model with three more variables: consumers’ product knowledge, perceived consumer effectiveness, and perceived personal relevance. Their results indicated that consumer knowledge of sustainable apparel significantly affected young consumers’ (18-29 years old) attitudes toward purchasing the products. For example, consumers believed that purchasing behavior could affect the environment or society if they had more knowledge of sustainable apparel products. Further, the college students’ intentions to purchase sustainable apparel could be positively predicted by consumers’ attitudes.

Han and Chung (2014) collected data through a web-based survey of 200 female South Korean residents older than 18. The results showed that attitudes toward purchasing organic cotton apparel were one of the factors significantly influencing consumers’ purchase intentions. Another survey study published in 2014 conducted by Cowan and Kinley (2014) among men and women (18 years and older) found that participants’ attitudes toward sustainable action,
especially environmentally sustainable action, positively predicted individuals’ intentions to purchase environmentally friendly apparel.

In general, consumers’ attitudes toward sustainable apparel are a direct positive predictor of consumers’ purchase intentions and an indirect predictor of purchase behavior (Chen & Chai, 2010; Kang & Kim, 2013; Zheng & Chi, 2015). Simultaneously, consumers’ attitudes can be influenced by some factors, such as emotions, knowledge, and values (Ajzen, 1991). Specifically, when individuals have more knowledge regarding sustainable apparel, they may have a positive attitude toward sustainable apparel and a stronger purchase intention. Therefore, the concept of consumer knowledge is presented first in the next section, followed by the relationship between consumer knowledge and the TPB.

**Consumer Knowledge**

*Definition*

Knowledge was described as the information stored in an individual’s memory, which would impact the method used to evaluate related selection and the final decision (Gamble & Blackwell, 2001). Similarly, consumer knowledge was recognized as a characteristic that influenced consumers’ decision-making phases (Onel & Mukherjee, 2016). Consumers have various sorts of knowledge, such as knowledge about a particular brand, policies, and general issues. Consumer knowledge of products (i.e., sustainable apparel) is a kind of consumers’ indispensable knowledge that can be regarded as consumers’ possession of specific information about a particular product or product category.

*Structure and Assessment*

Different terms have been used to describe consumer knowledge of products and various methods have been employed to evaluate consumer knowledge. Park and Lessig (1981) used
“product familiarity” as an alternative to consumer knowledge of products and identified two approaches to measure product familiarity. The first was to measure consumers’ product familiarity in terms of the amount of information they have known about the product. The other was to measure consumers’ product familiarity by assessing how much they thought they knew about the product. Knowledge measured by the first approach could be considered as consumers’ long-term memory (LTM). The second approach assessed consumer knowledge based on the consumers’ self-report of how much they thought they knew about the product.

In 1985, Brucks employed the term “product class knowledge” to describe consumers’ knowledge of products. He summarized the knowledge structure applied by previous research. Then, he developed three items to measure consumers’ product class knowledge. The first was consumers’ perception of how much they knew. This was consistent with the second one identified by Park and Lessig (1981) as self-report knowledge. The second one was the knowledge amount and type that consumers actually had stored in memory, and this was consistent with the first one used by Park and Lessig (1981) as LTM. The third one was consumers’ purchasing or use frequency of a specific product or product category.

In 1994, Park, Mothersbaugh, and Feick described the knowledge structure in the research of Park and Lessig (1981) as two terms: “objective knowledge” and “subjective knowledge.” The former was accurate information about a product class stored in consumers’ LTM, and the latter term was self-assessed knowledge. They proposed that even though subjective and objective knowledge were related, it was essential to distinguish different knowledge categories to ensure clarity and consistency in consumer knowledge’s conceptualization and operationalization.
Three knowledge categories are discussed above. However, in this research, consumers’ purchasing/usage experience is not involved in assessing consumer knowledge for two reasons. First, consumers’ objective and subjective knowledge, especially post-use knowledge, is developed through the purchasing/use experience (Selnes, 1986). Second, consumers’ purchasing/use experience is a factor that may influence consumers’ existing objective and subjective knowledge (Park & Moon, 2003). Hence, consumers’ purchasing/use experience falls into a different level or dimension from consumers’ objective and subjective knowledge. Thus, consumers’ knowledge is separated into objective and subjective knowledge. Further, consumer knowledge is assessed based on these two knowledge categories in this research.

**Consumer Knowledge of Sustainable Apparel**

The two categories of sustainable practices have been identified as environmentally sustainable practices and socially sustainable practices. Correspondingly, there are two categories of sustainable apparel in this study: environmentally sustainable apparel (ESA) and socially sustainable apparel (SSA). Considering both the concept of consumers’ product knowledge structure discussed in the last section and the categories of sustainable apparel, consumer knowledge of sustainable apparel can be categorized in Figure 2.5.

Consumer knowledge related to sustainable apparel (ESA and SSA) is separated into consumer knowledge of ESA and consumer knowledge of SSA. There are two sub-categories divided by the structure of consumer knowledge - objective and subjective knowledge for each type. Overall, consumer knowledge on sustainable apparel has fallen into four groups: objective knowledge of ESA, subjective knowledge of ESA, objective knowledge of SSA, and subjective knowledge of SSA. Further, these four groups were used as a guide to development instruments assessing consumer knowledge on sustainable apparel.
Instruments Used to Assess Consumer Knowledge of Sustainable Apparel

**Consumer Knowledge of Environmentally Sustainable Apparel (ESA).** In Table 2.4, items were developed and used by Kim and Damhorst in 1998. Later, this instrument was used by Kozar and Connell (2013) to examine the relationships between knowledge and attitudes and between knowledge and ESA consumption behaviors. The 11 statements were chosen from scientific literature and issues in the T/A industry during the research period, around 1998. They were used to assess respondents’ objective knowledge about apparel production and its impacts on the environment.

Specifically, these items assessed consumer knowledge related to water pollution (items 1, 2, and 9), water consumption (5), carbon footprint (11), air pollution (4), textile waste and disposal (6, 7, 8, and 10) and regulatory policies (3). A seven-point scale was used for each measure to assess consumers’ knowledge. In this format, respondents agreed (7) or disagreed (1) with each statement. Agreement with seven of the items (true items 1, 4, 5, 7, 8, 9, and 10) and
disagreement with four of the items (false items 2, 3, 6, and 11) indicated that respondents were informed and aware of environmental facts related to apparel products.

**Table 2.4**

*Instrument Assessing Consumers’ Objective Knowledge of Environmentally Sustainable Apparel (Kim & Damhorst, 1998)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Chemical pollutants are produced during manufacturing of synthetic or manufactured fibers such as polyester.</td>
</tr>
<tr>
<td>2.</td>
<td>Chemical pollutants are not produced during processing of natural fibers such as cotton.</td>
</tr>
<tr>
<td>3.</td>
<td>Federally and regionally mandated standards for clean air and water have not yet been imposed on textile companies.</td>
</tr>
<tr>
<td>4.</td>
<td>Air pollution can occur during some common dye processes of textiles.</td>
</tr>
<tr>
<td>5.</td>
<td>Dyeing and finishing processes use a lot of water.</td>
</tr>
<tr>
<td>6.</td>
<td>Fibers such as wool cannot be commercially recycled.</td>
</tr>
<tr>
<td>7.</td>
<td>Disposable diapers have substantially contributed to the quantity of textile products discarded in landfills.</td>
</tr>
<tr>
<td>8.</td>
<td>Special finishes on fabrics may create problems for recycling.</td>
</tr>
<tr>
<td>9.</td>
<td>Phosphate-containing detergents can be a source of water pollution.</td>
</tr>
<tr>
<td>10.</td>
<td>Natural fibers are usually bio-degradable.</td>
</tr>
<tr>
<td>11.</td>
<td>The use of larger quantities of natural fibers will significantly decrease energy consumption.</td>
</tr>
</tbody>
</table>

The two items in Table 2.5 were developed by Kang et al. (2013) and used to assess consumers’ subjective knowledge related to organic cotton apparel. Kang et al. (2013) used these items with a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree). “Strongly agree” indicated a high knowledge level and “strongly disagree” indicated a low knowledge level.
Table 2.5

*Instrument Measuring Consumers’ Subjective Knowledge of Organic Cotton Apparel (Kang et al., 2013)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am quite familiar with organic cotton apparel.</td>
</tr>
<tr>
<td>2.</td>
<td>I know quite a lot about organic cotton apparel.</td>
</tr>
</tbody>
</table>

**Consumer Knowledge of Socially Sustainable Apparel (SSA).** Limited research was found assessing consumers’ knowledge of SSA. The only one instrument measuring consumers’ objective knowledge of SSA found in the literature was developed and used by Dickson (1999), and later used by Connell and Kozar (2012) (Table 2.6). No instruments were found in the literature used to assess consumers’ subjective knowledge of SSA. Researchers used the eight items in Table 2.6 to assess consumers’ objective knowledge about social issues such as child labor and the treatment of workers in both the U.S. and foreign apparel manufacturing factories. These eight items were used on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 2.6

*Instrument Measuring Consumers’ Objective Knowledge of Socially Sustainable Apparel (Dickson, 1999)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Use of child labor is a practice among U.S. clothing manufacturers.</td>
</tr>
<tr>
<td>2.</td>
<td>Use of child labor is a practice among foreign clothing manufacturers.</td>
</tr>
<tr>
<td>3.</td>
<td>U.S. clothing manufacturers do not pay their employees at least the local wage.</td>
</tr>
<tr>
<td>4.</td>
<td>Foreign clothing manufacturers do not pay their employees at least the local wage.</td>
</tr>
<tr>
<td>5.</td>
<td>U.S. clothing manufacturers have their employees work more than 40 hours per week.</td>
</tr>
<tr>
<td>6.</td>
<td>Foreign clothing manufacturers have their employees work more than 40 hours per week.</td>
</tr>
<tr>
<td>7.</td>
<td>U.S. clothing manufacturers do not provide non-hazardous workplaces for their employees.</td>
</tr>
<tr>
<td>8.</td>
<td>Foreign clothing manufacturers do not provide non-hazardous workplaces for their employees.</td>
</tr>
</tbody>
</table>
The Influence of Consumer Knowledge

Consumer knowledge about a product is a well-explored construct in consumer behavior research. It can influence consumers’ decision-making processes, including product evaluation, attitude generation, and purchase intention (Chang, 2004; Park et al., 1994). Previous research found a relationship between knowledge and attitude toward products. Consumer knowledge was regarded as an extended factor in the TPB framework (Ajzen et al., 2011; Polonsky et al., 2012).

Studies on the influence of general environmental knowledge and concerns on actual behavior have been conducted. Hines, Hungerford, and Tomera (1987) sought to identify the variable or variables that appeared to be the most influential in motivating individuals to take responsible environmental action. In their research, knowledge of environmental issues was determined to be associated with responsible environmental behavior.

Congruently, in the literature on sustainable T/A, consumer concern and knowledge have also been added as direct predictors of consumers’ attitudes and indirect predictors of consumers’ intentional purchasing behavior. Many studies (e.g., Cowan & Kinley, 2014; Kang et al., 2013; Kozar & Connell, 2013) aimed to obtain an overall and complicated understanding of the hierarchical and interactive relationship among consumer knowledge, attitude, behavioral intention, willingness to pay, and the actual purchase behavior.

However, fewer studies have concentrated on the part of the sophisticated relationship. For instance, Kim, Lee, and Hur (2012) explored whether eco-friendly consumers’ behavior in the apparel market was influenced by variations in social norms and by consumer’s environmental concerns. Brosdahl and Carpenter (2010) investigated consumers’ environment-friendly consumption behavior related to textile and apparel products, focusing on the effects of the knowledge of the environmental impact. They found that consumers’ knowledge of the
environmental impacts led to concern for the environment, which then influenced consumers’ attitudes toward environmentally friendly products.

In these studies, researchers focused on the whole hierarchical and interactive relationship or the part of the sophisticated relationship in the TPB, and “knowledge” was frequently regarded as a factor. In 1998, Kim and Damhorst examined how consumers’ knowledge of apparel products’ environmental issues related to consumers’ concerns for the environment and subsequent behaviors toward the environment. Hence, it can be confirmed that research on consumer knowledge and consumer behavior has been more than twenty years, and it is a meaningful topic.

In most of the studies involving knowledge as a factor, it was found that there was a direct positive relationship between consumer knowledge and attitudes. In turn, there was an indirect positive relationship between consumer knowledge and purchase intention. Precisely, consumers’ awareness of sustainability (issues and practices) influenced their favorable attitudes toward sustainable products.

For instance, Kang et al. (2013) investigated consumers’ objective knowledge and subjective knowledge concerning environmentally sustainable textile products and generalized a structural equation estimation. It was shown that consumer knowledge, perceived consumer effectiveness, and perceived personal relevance all played essential roles in developing consumers’ attitudes, subjective norms, and behavioral control. Subsequently, young consumers’ (college students) purchase intention of environmentally sustainable T/A was affected. Specifically, consumers’ intention to purchase the products got stronger when they have more relevant knowledge.
Kozar and Connell (2013) used Kim and Damhorst’s (1998) eleven statements and a 5-point scale to evaluate consumers’ objective knowledge of environmentally sustainable textile products. Their results revealed that knowledge and attitudes explained 37.4 percent of the variance in behavior, with knowledge being a stronger contributor over attitudes. Additional simple linear regression analyses showed significant positive relationships among knowledge, attitudes, and environmentally responsible apparel purchasing. Participants who indicated higher knowledge about apparel products’ environmental issues reported more engagement in purchasing environmentally responsible apparel. Their results were not consistent with those of Kim and Damhorst (1998), which did not show a significant relationship between knowledge and attitudes or knowledge and purchase intention.

Kozar and Connell (2013) also investigated consumers’ subjective knowledge of social issues in apparel production by employing the instrument developed by Dickson (1999). Dickson (1999) did not manifest distinguished relationships between consumers’ knowledge and their behavior. In contrast, Kozar and Connell’s findings indicated that the consumers who perceived themselves as more knowledgeable about apparel social issues would hold stronger attitudes about these issues and stronger intention to purchase socially sustainable apparel.
Communication with Consumers

Needs for Better Communication

Consumer knowledge of sustainable products was confirmed as an essential predictor of consumer behavior, and consumers had an increasing interest in the T/A industry’s issues and sustainable practices. However, it was notable that consumers’ lack of knowledge on sustainable apparel was striking (Connell, 2011; Laitala & Klepp, 2013; Shen et al., 2012). These researchers suggested further communication with consumers on sustainability in the T/A industry to improve consumers’ purchase intention and impel sustainable development. Specifically, they suggested companies introduce their products and formulate communication messages via labels and below-the-line channels such as websites, blogs, and social network sites. However, currently, companies’ work on communication with consumers does not seem to be sufficient.

Consumers are also complaining about the lack of resources to improve their awareness of sustainable apparel and asking for more efforts made by companies for better information. Hill and Lee (2012) noted that confusing messages related to sustainability in the market, such as the ambiguous “green fashion,” had led consumers to misunderstand sustainable apparel and negatively influenced consumers’ acquisition of knowledge. Therefore, they conducted an open-ended survey to explore consumers’ specific perspectives of sustainability messages in the T/A industry and consumers’ actual knowledge of sustainability and environmental issues in general and the apparel industry. They identified consumers’ low levels of knowledge about both the holistic principles of sustainability and specific knowledge related to the apparel industry. Participants claimed that concerted action must be taken in this industry toward a more
sustainable future, and they confirmed the need for more concise educational and marketing communication.

Austgulen (2016) conducted a study and obtained some similar results with Hill and Lee (2012) on consumer knowledge and sustainability communication. His research was based on a cross-national survey conducted in five Western European countries. He found that inadequate education and communication experiences consumers had acquired could be a reason for consumers’ limited knowledge about the environmental impacts of textile and clothing consumption. According to consumer” responses, it can be inferred that the present communication between companies and consumers on sustainable apparel is incomplete and improper.

The communication needs have also been addressed in industry research reports and conferences. For instance, Karp (2018) mentioned it in the American Apparel & Footwear Association (AAFA) webinar. Messura (2018) explained the importance of communication to educate consumers in his speech, presented on November 1, 2018, at the Cotton and Sustainability Symposium at NC State University’s Wilson College of Textiles Raleigh, NC.

Furthermore, the United Nations (UN) included consumer communication as a part of their Sustainable Development Goal (SDG) 12 in their 2030 Agenda (2015) as follows, “There also needs to be a significant focus on operating on the supply chain, involving everyone from producer to the final consumer. This includes educating consumers on sustainable consumption and lifestyles, providing them with adequate information through standards and labels and engaging in sustainable public procurement, among others”.

Various sectors confirmed the need for more concise communication and marketing campaigns to educate consumers. Even though better communication with consumers has been
recognized as a crucial mission and an indispensable method to educate consumers and enrich their related knowledge on apparel sustainability, there is limited research on this topic to support better communication between companies and consumers. There are studies on educating concerning sustainable T/A products, but the education objects are college students (Armstrong & LeHew, 2014; Landgren & Pasricha, 2011) in higher education and designers (Leerberg et al., 2010).

Moreover, even less research was found examining the results of the communication. Connell and Kozar (2012) found that students in a sustainability class had more knowledge of social and environmental issues relevant to the T/A industry at the end of the class than at the beginning of the course. The results meant that higher education was an effective way to help students accumulate related knowledge. However, the study did not find any significant changes in students’ purchasing behavior related to sustainable apparel at the end of this class. In other words, there was not a significant relationship found between students’ knowledge and their reported purchasing behavior. Hence, communication in the class may not be effective enough in influencing consumer behavior. It can be doubted whether the appropriate knowledge has been imparted as expected through proper communication or not.

Overall, there is a need for more effective communication with consumers on sustainable apparel. It is vital and urgent for researchers to complete systematic research on communication methods and examine communication effects. Hence, the proposed research is conducted to enrich the existing knowledge and fill the present research gaps in consumer communication on sustainable apparel.
Communication Methods

Communication with consumers on sustainable apparel is still a new and emerging research area. Hence, there is little literature exploring communication methods or examining their effects. Some of the most frequently used methods in the market are shown in Table 2.7.

Table 2.7

*Communication Methods in the Textile and Apparel Industry*

<table>
<thead>
<tr>
<th>Category</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offline</td>
<td>Hangtags</td>
</tr>
<tr>
<td></td>
<td>Labels in Apparel</td>
</tr>
<tr>
<td></td>
<td>Posters</td>
</tr>
<tr>
<td></td>
<td>Leaflets</td>
</tr>
<tr>
<td>Online</td>
<td>Webpages of Product</td>
</tr>
<tr>
<td></td>
<td>Webpages of Company</td>
</tr>
<tr>
<td></td>
<td>Social Media (i.e., Instagram, Facebook, Twitter)</td>
</tr>
<tr>
<td></td>
<td>Television</td>
</tr>
<tr>
<td></td>
<td>Radio</td>
</tr>
</tbody>
</table>

Based on consumers’ access to communication, these communication methods are categorized into offline and online. Since this research’s objective is not examining the effects of all communication methods, only two methods, one offline and one online, are involved in this research. These two methods, hangtags and webpages of products, are used by many companies, such as Nike and H&M, to introduce their products’ sustainability and sustainability performance.

**Offline-Hangtags**

Hangtags are conventional communication medias used by apparel companies to convey the brand, inform consumers about a company’s mission, and educate consumers about product attributes and benefits. Before the emergence and popularization of online shopping, hangtags were the primary methods to reinforce product labeling and advertising. The use of hangtags to communicate with consumers can influence consumers’ attitudes to a particular apparel product.
or company and further guide their merchandise selections (Chowdhary, 2003). Information on hangtags can be expressed via text, graphics, or both.

For sustainable T/A, there is a group of exclusive labels, known as eco-labels, which are commonly attached on a separate hangtag. Usually, eco-labels contain policies and program information designed to inform consumers about the sustainable practices related to the product (Darnall & Aragón-Correa, 2014). Figure 2.6 displays the hangtags of a pair of jeans produced by Cone Denim with REPREVE® fibers (recycled polyester). Most eco-labels rely on external third-party certification. Therefore, companies can increase consumers’ knowledge of issues in the T/A industry and sustainable practices to reduce consumers’ uncertainty about the validity of sustainable apparel claims with eco-labels. Thus, eco-labels are more likely to ensure excellent conformance to specific sustainability standards and shape consumers’ positive responses to apparel products (Hyllegard et al., 2012).

Figure 2.6

Jeans with the REPREVE® Label (REPREVE®, 2017)

Online-Webpages

Research concerning e-commerce and its role in communicating with, attracting, and retaining consumers is not an emerging area. In 1999, Dhamija, Heller, and Hoffman identified the importance of e-commerce for companies to advertise their business. More recently, the
broad use of website features across different industries were identified. Also, researchers addressed the vital role that website contents played in consumers’ online purchasing processes (Verhagen et al., 2010).

The webpages of several T/A companies (i.e., H&M, Patagonia) that selling sustainable apparel online were reviewed. It was found that companies added some information related to their sustainable practices (i.e., “made of recycled polyester”) for a specific sustainable apparel product on the webpage devoted to the product. Even though companies are using products’ webpages to communicate with consumers, there is a lack of research concerning this kind of communication.

There are studies investigating companies’ use of webpages to communicate about sustainability, but the objects are not consumers (Sanil & Ramakrishnan, 2015; Siano et al., 2016). For example, Sanil and Ramakrishnan’s (2015) research explored apparel companies’ communication with their stakeholders (suppliers, shareholders, but not consumers) on their sustainability performances using websites. Overall, no research focused on communication about sustainable apparel between companies and consumers through products’ webpages.

Certifications

Certifications are used by companies when communicating with consumers via hangtags and webpages to ensure consumers’ trust for their sustainable practices. Some of the most widely used certifications are presented in Appendix A. Among these certifications, STANDARD 100 by OEKO-TEX®, Global Organic Textile Standard (GOTS), and Fair Trade Certified™ are widely accepted by T/A companies and discussed in academic studies (Brach et al., 2018; Oelze et al., 2020). Considering that there are a large number of certifications in this industry, only these three are introduced in this research as follows:
Each Fair Trade Certified™ product aims to provide safe working conditions and sustainable livelihoods for factory workers worldwide. The additional revenue companies generate with every sale is used to fund critical projects that address sustainability implementation. Suppose a T/A product is Fair Trade Certified™. In that case, it means that the people making the product work in safe conditions, protect the environment, build sustainable livelihoods, and earn additional money to empower and uplift their communities. (Fair Trade Certified, 2020).

STANDARD 100 by OEKO-TEX® is a global, independent testing and certification system for raw, semi-finished, and finished textile products at all processing levels. Each OEKO-TEX® label consists of five essential elements that must be included in every version of the label: 1) the respective product logo; 2) the test number/product-ID and the name of the responsible OEKO-TEX® institute; 3) the explanatory label text, like “Tested for harmful substances and produced sustainably following OEKO-TEX® guideline”; 4) the respective internet address; and 5) the frame around all other label contents (STANDARD 100 by OEKO-TEX®, 2020).

Global Organic Textile Standard (GOTS) unifies the various existing standards and draft standards in eco textile processing and provide a credible assurance to the end consumer. A textile product carrying the GOTS label grade ‘organic’ must contain a minimum of 95% certified organic fibers. A product with the label grade ‘made with organic’ must have a minimum of 70% certified organic fibers (Global Organic Textile Standard, 2020).
Hypothesis Development

Hypothesis Group One: Consumer Knowledge

In this research, consumer knowledge of sustainable apparel was separated into consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA), subjective knowledge of environmentally sustainable apparel (SUK-ESA), objective knowledge of socially sustainable apparel (OBK-SSA), and subjective knowledge of socially sustainable apparel (SUK-SSA) earlier in Figure 2.5. According to the theories related to consumer knowledge, the hypotheses 1-4 were developed as:

H1. Consumers’ OBK-ESA and SUK-ESA are not equal.
H2. Consumers’ OBK-SSA and SUK-SSA are not equal.
H3. Consumers’ OBK-ESA and SUK-ESA are positively correlated.
H4. Consumers’ OBK-SSA and SUK-SSA are positively correlated.

Hypothesis Group Two: The Theory of Planned Behavior

There was limited research investigating consumers’ objective knowledge and subjective knowledge regarding environmentally sustainable apparel (ESA) and socially sustainable apparel (SSA). Depending on the narrow research results on consumer knowledge, attitudes, and purchase intention related to sustainable apparel, hypotheses 5-10 were developed as follows (Figure 2.7):

Figure 2.7
Hypotheses on the Theory of Planned Behavior

\[ \text{Knowledge} \rightarrow \text{Attitude} \rightarrow \text{Intention} \]

H5 and H6

H7 and H8

H9 and H10
H5a. Consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and attitudes toward the impact of purchasing ESA (ATT-ESA) are positively correlated.

H5b. Consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) and ATT-ESA are positively correlated.

H6a. Consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and attitudes toward the impact of purchasing SSA (ATT-SSA) are positively correlated.

H6b. Consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) and ATT-SSA are positively correlated.

H7a. Consumers’ OBK-ESA and intentions to purchase environmentally sustainable apparel (INT-ESA) are positively correlated.

H7b. Consumers’ SUK-ESA and INT-ESA are positively correlated.

H8a. Consumers’ OBK-SSA and intentions to purchase socially sustainable apparel (INT-SSA) are positively correlated.

H8b. Consumers’ SUK-SSA and INT-SSA are positively correlated.

H9. Consumers’ ATT-ESA and INT-ESA are positively correlated.

H10. Consumers’ ATT-SSA and INT-SSA are positively correlated.

**Hypothesis Group Three: Effects of Communication**

Based on communication methods and the relationship between communication and consumer knowledge, the theoretical framework (Figure 2.8) was built. Related hypotheses, H11-28, were identified, as shown below.
H11a. The use of hangtags to communicate with consumers on environmentally sustainable apparel (ESA) will increase consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA).

H11b. The use of hangtags to communicate with consumers on ESA will increase consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA).

H12a. The use of hangtags to communicate with consumers on socially sustainable apparel (SSA) will increase consumers’ objective knowledge of socially sustainable apparel (OBK-SSA).

H12b. The use of hangtags to communicate with consumers on SSA will increase consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA).

H13a. The use of product webpages to communicate with consumers on ESA will increase consumers’ OBK-ESA.
H13b. The use of product webpages to communicate with consumers on ESA will increase consumers’ SUK-ESA.

H14a. The use of product webpages to communicate with consumers on SSA will increase consumers’ OBK-SSA.

H14b. The use of product webpages to communicate with consumers on SSA will increase consumers’ SUK-SSA.

According to the influence of communication on consumer knowledge and the theory of planned behavior, hypotheses 15, 16, 17, and 18 were developed as:

H15. The use of hangtags to communicate with consumers on ESA will make consumers’ attitudes toward the impact of purchasing environmentally sustainable apparel (ATT-ESA) more positive.

H16. The use of product webpages to communicate with consumers on ESA will make consumers’ ATT-ESA more positive.

H17. The use of hangtags to communicate with consumers on SSA will make consumers’ attitudes toward the impact of purchasing socially sustainable apparel (ATT-SSA) more positive.

H18. The use of product webpages to communicate with consumers on SSA will make consumers’ ATT-SSA more positive.

H19. The use of hangtags to communicate with consumers on ESA will increase consumers’ intentions to purchase environmentally sustainable apparel (INT-ESA).

H20. The use of product webpages to communicate with consumers on ESA will increase consumers’ INT-ESA.

H21. The use of hangtags to communicate with consumers on SSA will increase consumers’ intentions to purchase socially sustainable apparel (INT-SSA).
H22. The use of product webpages to communicate with consumers on SSA will increase consumers’ INT-SSA.

As the two communication methods are different, it was assumed that their effects in influencing consumer knowledge, attitudes, and intentions varied. Specifically, the hypotheses were developed as:

H23a. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) are different.

H23b. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) are different.

H24a. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) are different.

H24b. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) are different.

H25. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ attitudes toward the impact of purchasing ESA (ATT-ESA) are different.

H26. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ attitudes toward the impact of purchasing SSA (ATT-SSA) are different.
H27. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ intentions to purchase ESA (INT-ESA) are different.

H28. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ intentions to purchase SSA (INT-SSA) are different.
CHAPTER 3

METHODOLOGY

The purpose of this research was to investigate consumer knowledge of sustainable apparel and examine the effects of communication, referring to providing consumers with related information regarding sustainable apparel. The impacts of various communication methods could be investigated by examining communication outcomes (knowledge, attitudes, and intentions). However, there were not accurate instruments available to assess the direct outcome, consumer knowledge of sustainable apparel. Hence, two objectives were identified and addressed in this research.

Objective 1: Develop instruments to assess consumer knowledge of sustainable apparel and assist in the implementation of objective 2.

Objective 2: Investigate the impacts of various communication methods by examining both direct and indirect outcomes.

The methodology is separated into two sections according to the two objectives. Figure 3.1 was developed to aid in the visualization of the methodology and the process is further developed throughout this chapter.
**Objective One**

The first objective of this research is developing instruments to assess consumer knowledge of sustainable apparel. A qualitative review of the instruments used to assess consumer knowledge of sustainable T/A products in the literature was conducted and reported in chapter 2, “Literature Review” of this dissertation. Reviewing the instruments aimed to explore the basic structure and composition of a knowledge assessment instrument. The essential issues and sustainable practices in the T/A industry were also identified and reviewed in chapter 2.

To develop an appropriate instrument for this research, the previous instruments were compared with the currently identified critical issues and sustainable practices in the T/A industry to determine if any essential items were missing in the previous instruments. From this comparison, an instrument used to assess consumers’ objective and subjective knowledge of sustainable apparel was developed for use here. Detailed information on this analysis follows.
Consumer Knowledge of Environmentally Sustainable Apparel

The instrument assessing consumers’ objective knowledge of environmentally sustainable apparel developed and used by Kim and Damhorst (1998) (Table 2.4) was reviewed and analyzed. It was noted that the items in this instrument were related to issues in T/A production and difficulties in implementing sustainability in this industry. However, sustainable practices, such as sustainable fibers and certifications, were missing from this instrument. Moreover, these items were initially developed over 20 years ago in 1998. As a result, emerging and current industry issues, such as microfiber pollution, were not included in Kim and Damhorst’s (1998) instrument. Hence, Kim and Damhorst’s (1998) instrument was revised, and a list of items (Table 3.1) was developed to fill the gaps in their instrument. The false statements are marked in the parentheses.
Table 3.1

*Instrument I: Assessing Consumers’ Objective Knowledge of Environmentally Sustainable Apparel (Developed for This Study)*

<table>
<thead>
<tr>
<th>ESA Knowledge</th>
<th>Water Consumption</th>
<th>1. Production and processing of natural fibers such as cotton does not consume large quantities of water. (False)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2. Dyeing and finishing processes use a lot of water.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. There are water-saving and chemical-saving technologies in the textile and apparel industry, such as form dyeing.</td>
</tr>
<tr>
<td>Water Pollution</td>
<td></td>
<td>4. The textile and apparel industry is one of the major polluting industries in the world.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Chemical pollutants are not produced during cultivation of natural fibers such as cotton. (False)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Microfiber pollution is related to the textile and apparel industry.</td>
</tr>
<tr>
<td>Carbon Footprint</td>
<td></td>
<td>7. The textile and apparel industry is a large contributor to greenhouse gas emission.</td>
</tr>
<tr>
<td>Waste</td>
<td></td>
<td>8. Natural fibers can decompose in landfills, so that sending natural fibers into landfills will not be harmful to the environment. (False)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. With the help of companies’ take-back programs, global annual textile and apparel waste is decreasing. (False)</td>
</tr>
<tr>
<td>Consumers</td>
<td></td>
<td>10. Consumers do not contribute to the environmental issues associated with the textile and apparel industry. (False)</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td>11. BCI cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.</td>
</tr>
<tr>
<td>Products</td>
<td></td>
<td>12. Only the production of fast fashion products will cause environmental issues. (False)</td>
</tr>
<tr>
<td>Commitment</td>
<td></td>
<td>13. Some companies in the textile and apparel industry have made commitment to be more sustainable.</td>
</tr>
<tr>
<td>Certifications</td>
<td></td>
<td>14. There are certifications in the textile and apparel industry to ensure products’ environmental sustainability.</td>
</tr>
</tbody>
</table>

There was only one instrument found in the literature related to consumers’ subjective knowledge of environmentally sustainable apparel (ESA) (Table 2.5). Kang et al. (2013) developed and used it to assess consumers’ subjective knowledge of organic cotton apparel. The two items in Kang et al.’s (2013) instrument (Table 2.5) specifically focused on the apparel made from organic cotton. However, the present research aimed to assess consumers’ subjective knowledge of general ESA products. ESA included organic cotton apparel but was broader than
that. Thus, the items in Table 2.5 were revised to meet the needs of the present research. The new instrument was developed to evaluate consumers’ subjective knowledge of ESA, as shown in Table 3.2.

**Table 3.2**

*Instrument II: Assessing Consumers’ Subjective Knowledge of Environmentally Sustainable Apparel (Developed for This Study)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am familiar with sustainable materials used in textile and apparel products.</td>
</tr>
<tr>
<td>2.</td>
<td>I am familiar with the environmental issues (i.e., water) in the textile and apparel industry.</td>
</tr>
<tr>
<td>3.</td>
<td>I am familiar with how to extend the life of textile and apparel products.</td>
</tr>
</tbody>
</table>

**Consumer Knowledge of Socially Sustainable Apparel**

There was only one instrument found in the literature used to assess consumers’ objective knowledge of socially sustainable apparel (SSA) (Dickson, 1999) (Table 2.6). Items in Table 2.6 were reviewed and analyzed to identify the gaps in Dickson’s (1999) instrument. It was found that these items were related to social issues, specifically labor issues, in T/A production. However, like one of the previous instruments developed by Kim and Damhorst (1998), it had been more than 20 years since the instrument was developed in 1999. There were some essential socially sustainable practices developed and adopted by this industry over those 20 years. However, these were not involved in Dickson’s (1999) instrument. For example, the adoption of codes of conduct and certifications, were missed from the instrument. Moreover, issues related to animal cruelty were not considered in the instrument. Hence, Dickson’s (1999) instrument was revised, and a list of items (Table 3.3) was developed to fill the gaps. The false statements are marked in the paratheses.
Table 3.3

*Instrument III: Assessing Consumers’ Objective Knowledge of Socially Sustainable Apparel*

(Developed for This Study)

<table>
<thead>
<tr>
<th>SSA Knowledge</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Labor</td>
<td>1. Use of child labor is a practice in the textile and apparel industry throughout the world.</td>
</tr>
<tr>
<td>Low Wages</td>
<td>2. Some employees in the textile and apparel industry are not paid minimum living wage.</td>
</tr>
<tr>
<td>Work Hours</td>
<td>3. Some employees in the textile and apparel industry work more than 40 hours per week.</td>
</tr>
<tr>
<td>Safety</td>
<td>4. The working conditions and safety of some employees in the textile and apparel industry cannot be ensured, for instance, there are building collapse and fires.</td>
</tr>
<tr>
<td>Health</td>
<td>5. Workers in the textile and apparel industry have the potential to be exposed to dangerous chemicals.</td>
</tr>
<tr>
<td>Code of Conduct</td>
<td>6. Adoption of codes of conduct is compulsory in the textile and apparel industry. (False)</td>
</tr>
<tr>
<td>Animals</td>
<td>7. Animal cruelty does not exist in the textile and apparel industry. (False)</td>
</tr>
<tr>
<td>Certifications</td>
<td>8. There are certifications in the textile and apparel industry to ensure products’ social sustainability.</td>
</tr>
</tbody>
</table>

No instruments were found in the literature used to assess consumers’ subjective knowledge of SSA. Hence, the items used to assess consumers’ subjective knowledge of SSA in the present research (Table 3.4) were developed based on the items in Table 3.2.

Table 3.4

*Instrument IV: Assessing Consumers’ Subjective Knowledge of Socially Sustainable Apparel*

(Developed for This Study)

1. I am familiar with the issues related materials obtained from animals in textile and apparel products.
2. I am familiar with the issues (i.e., wages) related to workers in the textile and apparel industry.
3. I am familiar with the effects made by the textile and apparel industry to impel socially sustainable apparel.
Objective Two

The second objective of this study is to investigate the impacts of various communication methods by examining both direct and indirect outcomes. This objective was achieved via the quantitative research method, a survey.

Survey Design

In this study, there were two kinds of sustainable apparel (ESA and SSA) and two communication methods (hangtags and webpages). Hence, a 2×2 factorial design was employed when developing the survey. Participants were randomly separated into four groups and assigned one of the four questionnaires (Table 3.5). For each questionnaire, there were five sections (a, b, c, d, and e). The four questionnaires are shown in Appendices B, C, D, and E.

Table 3.5
Questionnaire Design and Participant Groups

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Knowledge, Attitude, and Intention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>Objective &amp; Subjective Knowledge of ESA</td>
<td>Objective &amp; Subjective Knowledge of ESA</td>
<td>Objective &amp; Subjective Knowledge of SSA</td>
<td>Objective &amp; Subjective Knowledge of SSA</td>
</tr>
<tr>
<td>Attitude</td>
<td>To ESA</td>
<td>To ESA</td>
<td>To SSA</td>
<td>To SSA</td>
</tr>
<tr>
<td>Intention</td>
<td>To ESA</td>
<td>To ESA</td>
<td>To SSA</td>
<td>To SSA</td>
</tr>
<tr>
<td><strong>Treatments (Communication)</strong></td>
<td>Hangtags of ESA</td>
<td>Webpages of ESA</td>
<td>Hangtags of SSA</td>
<td>Webpages of SSA</td>
</tr>
<tr>
<td><strong>Post-Knowledge, Attitude, and Intention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>Objective &amp; Subjective Knowledge of ESA</td>
<td>Objective &amp; Subjective Knowledge of ESA</td>
<td>Objective &amp; Subjective Knowledge of SSA</td>
<td>Objective &amp; Subjective Knowledge of SSA</td>
</tr>
<tr>
<td>Attitude</td>
<td>To ESA</td>
<td>To ESA</td>
<td>To SSA</td>
<td>To SSA</td>
</tr>
<tr>
<td>Intention</td>
<td>To ESA</td>
<td>To ESA</td>
<td>To SSA</td>
<td>To SSA</td>
</tr>
</tbody>
</table>
In section a of all questionnaires, participants’ demographic information, including age, gender, ethnicity, and education, was collected. Respondents who did not want to report their ages were not included in the analysis.

In section b, participants were provided with an image of the apparel’s hangtags (Appendices B and D) or webpages (Appendices C and E). There was no information related to sustainability in the images. This section was used to build a scenario and let participants know the product they were looking for to purchase. In this research, jeans were selected as the product as jeans are one of the most common apparel products and they are unisex (Jegethesan et al., 2012).

In section c, participants’ knowledge, attitudes, and intentions toward sustainable apparel before communication were collected. Participants in groups 1 and 2 answered questions related to ESA (Appendices B and C). Simultaneously, participants in groups 3 and 4 responded to questions related to SSA (Appendices D and E).

In section d, several images of hangtags (Appendices B and D) or webpages (Appendices C and E) of sustainable apparel were provided. The information involved in the images were directly or indirectly related to the items used to assess consumer knowledge of sustainable apparel. Participants were asked to read the information. After reading this information, participants were prevented to go back to the previous questions. In this way, participants’ answers to the questions related to pre-knowledge, attitudes, and intentions were ensured to be made without communication.

Section e was the same with section c: participants’ knowledge, attitudes, and intentions toward sustainable apparel after communication were collected. Participants in groups 1 and 2
answered questions related to ESA (Appendices B and C). Simultaneously, participants in groups 3 and 4 responded to questions associated with SSA (Appendices D and E).

A total of four instruments were used in each questionnaire of this study. Specifically, they were used in sections c and e of the questionnaire to assess consumers’ objective knowledge, subjective knowledge, attitudes, and intentions toward sustainable apparel. In all questionnaires, the first two instruments were used to assess consumers’ objective and subjective knowledge of sustainable apparel. In the ESA questionnaires (Appendices B and C), instruments I and II (Tables 3.1 and 3.2) were used to assess consumers’ objective and subjective knowledge of ESA. In the SSA questionnaires (Appendices D and E), instruments III and IV (Tables 3.3 and 3.4) were used to assess consumers’ objective and subjective knowledge of SSA.

The third instrument was used to evaluate consumers’ attitudes toward the impact of purchasing sustainable apparel. There was one item in this instrument as, “I think purchasing this pair of jeans produced using environmentally sustainable practices is helpful in protecting the environment” or “I think purchasing this pair of jeans produced using socially sustainable practices is helpful in protecting the society and workers in the textile and apparel industry.”

The fourth instrument was used to measure consumers’ intentions to purchase sustainable apparel. Specifically, there was one item in this instrument as, “I will consider purchasing this pair of jeans produced using environmentally sustainable practices” or “I will consider purchasing this pair of jeans produced using socially sustainable practices.” All of the three instruments were based on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) (See details in Appendices B, C, D, and E).
Sample and Data Collection

Previous research showed that consumers aged 16 to 31 years old in 2012 were more concerned with apparel and more willing to buy sustainable products (Hill & Lee, 2012). They also have more money to support their purchase (Grotts & Johnson, 2013). However, younger people, such as post-millennials (born from 1997 to the early 2000s), were the future drivers of the T/A industry. Their interests in sustainable T/A products were growing fast (The Business of Fashion & McKinsey Company, 2020).

Hence, participants of this questionnaire were millennial consumers (24 to 39 years old in 2020) and Generation Z adult consumers (18 to 23 years old in 2020). Moreover, the instruments used to assess consumer knowledge, attitudes, and intentions were complicated, and participants would be required to read some provided information. Therefore, participants were required to have at least a high school diploma or equivalent.

Working with Qualtrics, an online standardized questionnaire was created. Contact details of the researchers were added in case of comments or questions. Qualtrics was engaged to distribute the questionnaire to apparel consumers and collect responses. According to the information provided by Qualtrics, participants were recruited from various sources, including website intercept recruitment, member referrals, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks, social media, etc. Participants were sent an email invitation or prompted on the respective survey platform to proceed with the given survey. Confidentially was assured, and informed consent was requested before beginning the questionnaire.
Data Analysis

Responses with incomplete data were not included in the analysis. Three methods of statistical analysis, Pearson’s correlations, $t$-tests, and paired $t$-tests were used in this research to analyze all hypotheses (H1-H28) (Table 3.6). Pearson’s correlation is a measure of the strength of the linear relationship between two variables. It is also simply referred correlation coefficient. The symbol for Pearson’s correlation is “$p$” when it is measured in the population and “$r$” when it is measured in a sample. Pearson’s $r$ ranges from -1 to 1. An $r$ of -1 indicates a perfect negative linear relationship between variables, an $r$ of 0 indicates no linear relationship between variables, and an $r$ of 1 indicates a perfect positive linear relationship between variables (Benesty et al., 2009).

A $t$-test, independent sample $t$-test, is a type of inferential statistic used to determine if there is a significant difference between the means of two groups. It is used when two separate sets of independent and identically distributed samples are obtained, one from each of the two populations being compared. A $t$-test is used as a hypothesis testing tool, which allows testing an assumption applicable to a population (Kim, 2015).

In contrast, the paired sample $t$-test, sometimes called the dependent sample $t$-test, is a statistical procedure used to determine whether the mean difference between two sets of observations is zero. In a paired sample $t$-test, each subject or entity is measured twice, resulting in pairs of observations. Common applications of the paired sample $t$-test include case-control studies or repeated-measures designs (Kim, 2015).
### Table 3.6

**Statistical Tests for Each Hypothesis**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1, H2</td>
<td>Comparison between objective and subjective knowledge</td>
<td>paired t-tests</td>
</tr>
<tr>
<td>H3, H4</td>
<td>Correlations between objective and subjective knowledge</td>
<td>Pearson’s correlations</td>
</tr>
<tr>
<td>H5, H6</td>
<td>Correlations between knowledge and attitudes</td>
<td>Pearson’s correlations</td>
</tr>
<tr>
<td>H7, H8</td>
<td>Correlations between knowledge and intentions</td>
<td>Pearson’s correlations</td>
</tr>
<tr>
<td>H9, H10</td>
<td>Correlations between attitudes and intentions</td>
<td>Pearson’s correlations</td>
</tr>
<tr>
<td>H11, H12, H13, H14</td>
<td>Effects of communication on knowledge</td>
<td>paired t-tests</td>
</tr>
<tr>
<td>H15, H16, H17, H18</td>
<td>Effects of communication on attitudes</td>
<td>paired t-tests</td>
</tr>
<tr>
<td>H19, H20, H21, H22</td>
<td>Effects of communication on intentions</td>
<td>paired t-tests</td>
</tr>
<tr>
<td>H23, H24, H25, H26, H27, H28</td>
<td>Difference in the effects of hangtags and webpages</td>
<td>t-tests</td>
</tr>
</tbody>
</table>
CHAPTER 4
RESULTS AND DISCUSSION

The purpose of this research was to investigate consumer knowledge of sustainable apparel and examine the effects of communication, referring to providing consumers with related information regarding sustainable apparel. Two objectives were identified to achieve the purpose. Objective one was to develop instruments to assess consumer knowledge of sustainable apparel. Objective two was to investigate the impacts of communication by examining direct outcomes (knowledge) and indirect outcomes (attitudes and intentions).

The first section of this chapter reports the results of objective one. The second section reports the results regarding objective two. Specifically, this section includes sample description, reliability and descriptive statistics, hypothesis testing results, and a summary of the hypothesis testing results. The third section presents the discussion regarding the results based on relevant theories and literature. Narrowly, discussion, is presented based on the results regarding the two categories of sustainable apparel, including the apparel produced under environmentally sustainable practices, known as environmentally sustainable apparel (ESA), and the apparel produced under socially sustainable practices, known as socially sustainable apparel (SSA).

Results of Objective One

In chapter 3 (Methodology), the key issues and sustainable practices in the T/A industry were compared with the items in the reviewed assessment instruments to investigate if there were any essential items missed in the reviewed instruments. As noted, the published instruments that were reviewed were well organized. However, there were three critical issues with the instruments.
First, two of the three reviewed instruments (Dickson, 1999; Kim & Damhorst, 1998) were developed more than 20 years ago. More information on sustainability has been shared within the industry, to the general public, and consumers during that time period. Second, some essential issues and sustainable practices, such as animal cruelty and the adoption of certifications, were not involved in the reviewed instruments. Third, the instrument developed by Kang et al. (2013) was not suitable to assess consumers’ subjective knowledge of general ESA products. In addition, there was a lack of instruments in the literature used to evaluate consumers’ subjective knowledge of SSA.

Considering these facts, some new items were added to the reviewed instruments, and the language of the items used in the reviewed instruments was modified to create the instruments used in this study. Specifically, four instruments were developed to assess four constructs, including consumers’ objective knowledge of ESA (Table 3.1), subjective knowledge of ESA (Table 3.2), objective knowledge of SSA (Table 3.3), and subjective knowledge of SSA (Table 3.4).

**Results of Objective Two**

**Sample Description**

In total, there were 815 responses, of which 702 were useable. Randomization and unusable responses resulted in inconsistent number of responses for each group. In general, the numbers of usable responses in the ESA-H (information of ESA was provided via hangtags), ESA-W (information of ESA was provided via webpages), SSA-H (information of SSA was provided via hangtags), and SSA-W (information of SSA was provided via webpages) groups (Table 4.1), were more than the recommended minimum of 21 participants per group.
The obtained datasets of usable responses were imported into and then analyzed in R Studio.

Table 4.1

Numbers of Total Responses and Usable Responses in Each Group

<table>
<thead>
<tr>
<th>Number of Responses</th>
<th>ESA-H</th>
<th>ESA-W</th>
<th>SSA-H</th>
<th>SSA-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>212</td>
<td>237</td>
<td>221</td>
<td>145</td>
</tr>
<tr>
<td>Usable</td>
<td>178</td>
<td>207</td>
<td>192</td>
<td>125</td>
</tr>
</tbody>
</table>

The targeted population in this study was the people who were aged 18-39 years old in 2020 and had at least a high school diploma or equivalent. The two age ranges were 18-23 and 24-39 years old. Thirty-five percent of the participants were 18-23 years old in 2020, and 65% of the participants were 24-39 years old in 2020. Participants reported education levels of high school diploma or equivalent, some college, bachelor’s degree, master’s degree, and doctorate degree. Approximately half (52%) of the participants reported having a bachelor’s, master’s, or doctorate degree. Additionally, about two thirds (66%) of the sample were female participants. The demographical constitutions of the four groups were similar, and the details are reported in Appendix F.

Reliability and Descriptive Statistics

Before examining the reliability and analyzing the descriptive statistics, the instruments and items used in the questionnaires were coded, as shown in Table 4.2 and Table 4.3. There were four questionnaires (ESA-H, ESA-W, SSA-H, and SSA-W). In each questionnaire, there were four instruments that were used to assess four constructs, including consumers’ objective knowledge, subjective knowledge, attitudes, and intentions toward sustainable apparel.

For the two ESA questionnaires (ESA-H and ESA-W), the four instruments were the same. Similarly, for the two SSA questionnaires (SSA-H and SSA-W), the four instruments were
the same. For example, in the two ESA questionnaires, the four instruments included objective knowledge of ESA (OBK-ESA), subjective knowledge of ESA (SUK-ESA), attitudes toward the impact of purchasing ESA (ATT-ESA), and intentions to purchase ESA (INT-ESA).

Table 4.2

Coding of Constructs and Items Evaluating Knowledge, Attitudes, and Intentions toward ESA

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective knowledge of ESA (OBK-ESA)</td>
<td>The production and processing of natural fibers such as cotton consume large quantities of water.</td>
<td>OBK-ESA1</td>
</tr>
<tr>
<td></td>
<td>Adding color through dyeing and printing processes uses a lot of water.</td>
<td>OBK-ESA2</td>
</tr>
<tr>
<td></td>
<td>There are water-saving and chemical-saving technologies in the textile and apparel industry.</td>
<td>OBK-ESA3</td>
</tr>
<tr>
<td></td>
<td>The textile and apparel industry is one of the major polluting industries in the world.</td>
<td>OBK-ESA4</td>
</tr>
<tr>
<td></td>
<td>Chemical pollutants are produced during the cultivation of natural fibers such as cotton.</td>
<td>OBK-ESA5</td>
</tr>
<tr>
<td></td>
<td>Microfiber pollution is related to the textile and apparel industry.</td>
<td>OBK-ESA6</td>
</tr>
<tr>
<td></td>
<td>The textile and apparel industry is a large contributor to greenhouse gas emissions.</td>
<td>OBK-ESA7</td>
</tr>
<tr>
<td></td>
<td>Although natural fibers can decompose in landfills, sending natural fibers into landfills will be harmful to the environment.</td>
<td>OBK-ESA8</td>
</tr>
<tr>
<td></td>
<td>Although companies have take-back programs, global annual textile and apparel waste is not decreasing.</td>
<td>OBK-ESA9</td>
</tr>
<tr>
<td></td>
<td>Consumers contribute to the environmental issues associated with the textile and apparel industry.</td>
<td>OBK-ESA10</td>
</tr>
<tr>
<td></td>
<td>Better Cotton Initiative (BCI) cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.</td>
<td>OBK-ESA11</td>
</tr>
<tr>
<td></td>
<td>Not only the production of fast fashion products will cause environmental issues.</td>
<td>OBK-ESA12</td>
</tr>
<tr>
<td></td>
<td>Some companies in the textile and apparel industry have made commitments to be more sustainable.</td>
<td>OBK-ESA13</td>
</tr>
<tr>
<td></td>
<td>There are certifications in the textile and apparel industry to ensure a product is environmentally sustainable.</td>
<td>OBK-ESA14</td>
</tr>
</tbody>
</table>
Table 4.2

*Continued*

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective knowledge of ESA (SUK-ESA)</td>
<td>I am familiar with the sustainable materials used in textile and apparel products.</td>
<td>SUK-ESA1</td>
</tr>
<tr>
<td></td>
<td>I am familiar with the environmental issues in the textile and apparel industry.</td>
<td>SUK-ESA2</td>
</tr>
<tr>
<td></td>
<td>I am familiar with how to extend the life of textile and apparel products.</td>
<td>SUK-ESA3</td>
</tr>
<tr>
<td>Attitude toward ESA (ATT-ESA)</td>
<td>I think purchasing these environmentally sustainable jeans helps protect the environment.</td>
<td>ATT-ESA</td>
</tr>
<tr>
<td>Intention to purchase ESA (INT-ESA)</td>
<td>I will consider purchasing these environmentally sustainable jeans.</td>
<td>INT-ESA</td>
</tr>
</tbody>
</table>

*Note.* Each construct and item include two sets, for example, PRE-OBK-ESA and POS-OBK-ESA, as the corresponding instruments are used twice in the questionnaire to evaluate consumers’ knowledge, attitudes, and intentions before and after communication.

*aThe wording of these statements has been modified to reflect the reverse coding of negative statements. For example, the original OBK-ESA1 is ‘The production and processing of natural fibers such as cotton do not consume large quantities of water.’*
Table 4.3

Coding of Constructs and Items Evaluating Knowledge, Attitudes, and Intentions toward SSA

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective knowledge of SSA (OBK-SSA)</strong></td>
<td>The use of child labor is a practice in the textile and apparel industry throughout the world.</td>
<td>OBK-SSA1</td>
</tr>
<tr>
<td></td>
<td>Some employees in the textile and apparel industry are not paid a living wage.</td>
<td>OBK-SSA2</td>
</tr>
<tr>
<td></td>
<td>Work extra hours is a common practice in the textile and apparel industry throughout the world.</td>
<td>OBK-SSA3</td>
</tr>
<tr>
<td></td>
<td>Some employees in the textile and apparel industry work under unsafe working conditions.</td>
<td>OBK-SSA4</td>
</tr>
<tr>
<td></td>
<td>Workers in the textile and apparel industry have the potential for exposure to dangerous chemicals.</td>
<td>OBK-SSA5</td>
</tr>
<tr>
<td></td>
<td>The adoption of codes of conduct is not mandatory in the textile and apparel industry.</td>
<td>OBK-SSA6</td>
</tr>
<tr>
<td></td>
<td>Animal cruelty exists in the textile and apparel industry.</td>
<td>OBK-SSA7</td>
</tr>
<tr>
<td></td>
<td>There are certifications in the textile and apparel industry to ensure a product is produced using socially sustainable practices.</td>
<td>OBK-SSA8</td>
</tr>
<tr>
<td><strong>Subjective knowledge of SSA (SUK-SSA)</strong></td>
<td>I am familiar with the issues related to materials obtained from animals in textile and apparel products.</td>
<td>SUK-SSA1</td>
</tr>
<tr>
<td></td>
<td>I am familiar with the issues related to workers in the textile and apparel industry.</td>
<td>SUK-SSA2</td>
</tr>
<tr>
<td></td>
<td>I am familiar with the efforts made by the textile and apparel industry to encourage apparel produced using socially sustainable practices.</td>
<td>SUK-SSA3</td>
</tr>
<tr>
<td><strong>Attitude toward SSA (ATT-SSA)</strong></td>
<td>I think purchasing this pair of jeans produced using socially sustainable practices helps protect society and workers in the textile and apparel industry.</td>
<td>ATT-SSA</td>
</tr>
<tr>
<td><strong>Intention to purchase SSA (INT-SSA)</strong></td>
<td>I will consider purchasing this pair of jeans produced using socially sustainable practices.</td>
<td>INT-SSA</td>
</tr>
</tbody>
</table>

*Note. Each construct and item include two sets, for example, PRE-OBK-SSA and POS-OBK-SSA, as the corresponding instruments are used twice in the questionnaire to evaluate consumers’ knowledge, attitudes, and intentions before and after communication.

*The wording of these statements has been modified to reflect the reverse coding of negative statements.*
Reliability

The reliability for the constructs with more than two items (OBK-ESA, SUK-ESA, OBK-SSA, SUK-SSA) was examined prior to testing all hypotheses. Each construct had two sets, for example, PRE-OBK-SSA and POS-OBK-SSA, as the corresponding instruments were used twice in the questionnaire before and after communication. Cronbach’s alpha (\(\alpha\)), as a measure of internal consistency, was used to assess the reliability of the constructs (Cortina, 1993). All coefficient estimates for the constructs were acceptable at the 0.70 level or higher (Cortina, 1993). The \(\alpha\)’s ranged from 0.71 to 0.85 (ESA-H), from 0.72 to 0.86 (ESA-W), from 0.79 to 0.81 (SSA-H), and from 0.75 to 0.82 (SSA-W) (Table 4.4).

Table 4.4
Reliability (Cronbach’s Alpha)

<table>
<thead>
<tr>
<th>Group</th>
<th>Construct</th>
<th>No. of items</th>
<th>(\alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESA-H</td>
<td>PRE-OBK-ESA</td>
<td>14</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>POS-OBK-ESA</td>
<td>14</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>PRE-SUK-ESA</td>
<td>3</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>POS-SUK-ESA</td>
<td>3</td>
<td>0.71</td>
</tr>
<tr>
<td>ESA-W</td>
<td>PRE-OBK-ESA</td>
<td>14</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>POS-OBK-ESA</td>
<td>14</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>PRE-SUK-ESA</td>
<td>3</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>POS-SUK-ESA</td>
<td>3</td>
<td>0.72</td>
</tr>
<tr>
<td>SSA-H</td>
<td>PRE-OBK-SSA</td>
<td>8</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>POS-OBK-SSA</td>
<td>8</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>PRE-SUK-SSA</td>
<td>3</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>POS-SUK-SSA</td>
<td>3</td>
<td>0.79</td>
</tr>
<tr>
<td>SSA-W</td>
<td>PRE-OBK-SSA</td>
<td>8</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>POS-OBK-SSA</td>
<td>8</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>PRE-SUK-SSA</td>
<td>3</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>POS-SUK-SSA</td>
<td>3</td>
<td>0.75</td>
</tr>
</tbody>
</table>
Descriptive Statistics

Environmentally Sustainable Apparel (ESA).

Descriptive Statistics of OBK-ESA and SUK-ESA Items. The mean scores and standard deviations of all items regarding the two constructs, including objective knowledge of environmentally sustainable apparel (OBK-ESA) and subjective knowledge of environmentally sustainable apparel (SUK-ESA), were calculated, and are presented in Table 4.5. For the ESA-H group, the mean score before communication (pre-\(M\)) is lower than the mean score after communication (post-\(M\)) on nine of the 14 (64\%) OBK-ESA items. The pre-\(M\) of each of the other five items (OBK-ESA 1, 5, 8, 9, 12), as noted in Table 4.5, is not lower than the post-\(M\). Hence, participants’ knowledge levels of these five items did not increase after reading the information on ESA hangtags. Additionally, the pre-\(M\) is lower than post-\(M\) on all of the SUK-ESA items. Consumers’ SUK-ESA increased after reading the information on hangtags.

Similarly, for the ESA-W group, the mean score before communication (pre-\(M\)) is lower than the mean score after communication (post-\(M\)) on nine of the 14 (64\%) OBK-ESA items. The pre-\(M\) of each of the other five items (OBK-ESA 1, 2, 5, 8, 9), as notated in Table 4.5, is not lower than the post-\(M\). Thus, participants did not have greater knowledge regarding the five items after reading the information on ESA product webpages. Additionally, the pre-\(M\) is lower than the post-\(M\) on all of the SUK-ESA items. Thus, consumers’ SUK-ESA increased after reading the information on webpages.

The OBK-ESA items identified above (pre-\(M > \) post-\(M\)), including OBK-ESA 1, 2, 5, 8, 9, and 12, were related to the water consumption issues of natural fibers, water consumption issues of dyeing and printing processes, chemical pollution issues of natural fiber cultivation, disposal issues of natural fibers, issues of textile and apparel waste generation, and the general
environmental issues of apparel products in addition to fast fashion, respectively (see Table 4.2 for the specific items). Hence, participants were not effectively educated (which means participants’ knowledge does not increase in this study) regarding these subjects by reading the relevant information on ESA hangtags and webpages.

**Table 4.5**

*Participants’ Objective and Subjective Knowledge of ESA*

<table>
<thead>
<tr>
<th>Item</th>
<th>ESA-H</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre- M</td>
<td>Pre-SD</td>
<td>Post- M</td>
<td>Post-SD</td>
<td>Pre- M</td>
<td>Pre-SD</td>
<td>Post- M</td>
<td>Post-SD</td>
</tr>
<tr>
<td>OBK-ESA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBK-ESA1</td>
<td>3.19</td>
<td>1.13</td>
<td>3.02</td>
<td>1.22</td>
<td>3.12</td>
<td>1.05</td>
<td>2.98</td>
<td>1.13</td>
</tr>
<tr>
<td>OBK-ESA2</td>
<td>3.31</td>
<td>1.09</td>
<td>3.47</td>
<td>1.15</td>
<td>3.36</td>
<td>1.05</td>
<td>3.16</td>
<td>1.11</td>
</tr>
<tr>
<td>OBK-ESA3</td>
<td>3.37</td>
<td>1.13</td>
<td>3.60</td>
<td>1.09</td>
<td>3.36</td>
<td>1.07</td>
<td>3.38</td>
<td>1.15</td>
</tr>
<tr>
<td>OBK-ESA4</td>
<td>3.29</td>
<td>1.13</td>
<td>3.58</td>
<td>1.03</td>
<td>3.38</td>
<td>1.08</td>
<td>3.41</td>
<td>1.11</td>
</tr>
<tr>
<td>OBK-ESA5</td>
<td>2.91</td>
<td>1.13</td>
<td>2.67</td>
<td>1.15</td>
<td>2.97</td>
<td>1.11</td>
<td>2.70</td>
<td>1.01</td>
</tr>
<tr>
<td>OBK-ESA6</td>
<td>3.38</td>
<td>1.01</td>
<td>3.44</td>
<td>1.10</td>
<td>3.38</td>
<td>1.08</td>
<td>3.47</td>
<td>1.07</td>
</tr>
<tr>
<td>OBK-ESA7</td>
<td>3.35</td>
<td>1.07</td>
<td>3.47</td>
<td>1.02</td>
<td>3.30</td>
<td>1.15</td>
<td>3.41</td>
<td>1.05</td>
</tr>
<tr>
<td>OBK-ESA8</td>
<td>2.85</td>
<td>1.10</td>
<td>2.66</td>
<td>1.06</td>
<td>2.83</td>
<td>1.09</td>
<td>2.81</td>
<td>1.08</td>
</tr>
<tr>
<td>OBK-ESA9</td>
<td>2.66</td>
<td>1.07</td>
<td>2.53</td>
<td>1.09</td>
<td>2.72</td>
<td>1.07</td>
<td>2.69</td>
<td>1.09</td>
</tr>
<tr>
<td>OBK-ESA10</td>
<td>2.72</td>
<td>1.20</td>
<td>2.81</td>
<td>1.26</td>
<td>3.00</td>
<td>1.16</td>
<td>2.80</td>
<td>1.22</td>
</tr>
<tr>
<td>OBK-ESA11</td>
<td>3.32</td>
<td>1.06</td>
<td>3.45</td>
<td>1.15</td>
<td>3.36</td>
<td>1.04</td>
<td>3.45</td>
<td>1.15</td>
</tr>
<tr>
<td>OBK-ESA12</td>
<td>2.85</td>
<td>1.17</td>
<td>2.70</td>
<td>1.15</td>
<td>2.76</td>
<td>1.11</td>
<td>2.80</td>
<td>1.11</td>
</tr>
<tr>
<td>OBK-ESA13</td>
<td>3.57</td>
<td>1.05</td>
<td>3.64</td>
<td>0.99</td>
<td>3.38</td>
<td>1.04</td>
<td>3.46</td>
<td>1.17</td>
</tr>
<tr>
<td>OBK-ESA14</td>
<td>3.34</td>
<td>1.09</td>
<td>3.51</td>
<td>1.11</td>
<td>3.28</td>
<td>1.04</td>
<td>3.34</td>
<td>1.09</td>
</tr>
<tr>
<td>SUK-ESA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUK-ESA1</td>
<td>3.19</td>
<td>1.15</td>
<td>3.33</td>
<td>1.07</td>
<td>3.15</td>
<td>1.11</td>
<td>3.44</td>
<td>1.12</td>
</tr>
<tr>
<td>SUK-ESA2</td>
<td>3.23</td>
<td>1.16</td>
<td>3.35</td>
<td>1.12</td>
<td>3.21</td>
<td>1.17</td>
<td>3.37</td>
<td>1.06</td>
</tr>
<tr>
<td>SUK-ESA3</td>
<td>3.19</td>
<td>1.19</td>
<td>3.39</td>
<td>1.15</td>
<td>3.19</td>
<td>1.11</td>
<td>3.39</td>
<td>1.11</td>
</tr>
</tbody>
</table>

*Note.* Data in the table is based on five-point Likert scales (1-strongly disagree, 5-strongly agree). Pre- *M* is the mean score of the corresponding item before communication, and Post- *M* is the mean score of the related item after communication.

*a*For the ESA-H group, pre- *M* is not lower than post- *M*.

*b*For the ESA-W group, pre- *M* is not lower than post- *M*.  

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Furthermore, the scores for the OBK-ESA items were summed and averaged to obtain the score for the OBK-ESA construct. For the ESA-H group, the mean score for the construct of OBK-ESA before communication is 3.15 (pre-\(M\)). Comparing the pre-\(M\) of the OBK-ESA construct with the pre-\(M\) of the OBK-ESA items (Table 4.5), it was found that there were five of the 14 (36%) OBK-ESA items whose pre-\(M\) was lower than the pre-\(M\) of the OBK-ESA construct. The five items were OBK-ESA 1, 5, 8, 9, and 12.

For the ESA-W group, the mean score for the construct of OBK-ESA before communication is 3.16 (pre-\(M\)). Comparing the pre-\(M\) of the OBK-ESA construct with the pre-\(M\) of the OBK-ESA items (Table 4.5), it was found that there were six of the 14 (43%) OBK-ESA items whose pre-\(M\) was lower than the pre-\(M\) of the OBK-ESA construct. The six items were OBK-ESA 1, 5, 8, 9, 10, and 12.

The OBK-ESA items mentioned above (OBK-ESA 1, 5, 8, 9, 10, and 12) were related to the water consumption issues of natural fibers, chemical pollution issues of natural fiber cultivation, disposal issues of natural fibers, issues of textile and apparel waste generation, consumers’ inputs to the environmental issues, and the general environmental issues of apparel products in addition to fast fashion, respectively (see Table 4.2 for the specific items). Thus, participants were less knowledgeable about these subjects than about the other subjects in the questionnaire.

In general, for both the ESA-H and ESA-W groups, participants’ knowledge of the two items (OBK-ESA 8, 9) was relatively low. Additionally, their knowledge regarding the two items did not increase after communication. These two items were related to textile and apparel waste. Specifically, OBK-ESA8 was about the negative impacts of natural fiber disposal, and OBK-ESA9 was related to waste generation and the company’s take-back programs. Hence, it may be
challenging to effectively educate consumers regarding the issue of waste via hangtags and product webpages.

**Descriptive Statistics of OBK-ESA, SUK-ESA, ATT-ESA, and INT-ESA Constructs.**

Descriptive statistics of the constructs, including objective knowledge (OBK), subjective knowledge (SUK), attitudes (ATT), and intentions (INT) toward ESA before and after reading the information of ESA provided via hangtags and product webpages are presented in Table 4.6. The constructs were used as variables in this study to test hypotheses. Except for the variable, OBK-ESA, of the ESA-W group, mean scores on all variables increased after communication.

For the ESA-H group, participants’ OBK-ESA and SUK-ESA were greater after reading the information on hangtags. Their attitudes toward the impacts of purchasing environmentally sustainable apparel (ATT-ESA) were more positive, and their intentions to purchase environmentally sustainable apparel (INT-ESA) increased after communication. Similarly, for the ESA-W group, participants’ SUK-ESA was greater after reading the information on webpages. Their ATT-ESA were more positive, and INT-ESA increased after communication.
Table 4.6

Participants’ Knowledge, Attitudes, and Intentions toward ESA

<table>
<thead>
<tr>
<th>Variable</th>
<th>ESA-H</th>
<th></th>
<th></th>
<th>ESA-W</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>Skewness ($z$)</td>
<td>$M$</td>
<td>$SD$</td>
<td>Skewness ($z$)</td>
</tr>
<tr>
<td>PRE-OBK-ESA</td>
<td>3.15</td>
<td>0.32</td>
<td>0.60</td>
<td>3.16a</td>
<td>0.34</td>
<td>0.59</td>
</tr>
<tr>
<td>POS-OBK-ESA</td>
<td>3.18</td>
<td>0.33</td>
<td>0.91</td>
<td>3.13a</td>
<td>0.31</td>
<td>0.82</td>
</tr>
<tr>
<td>PRE-SUK-ESA</td>
<td>3.21</td>
<td>0.97</td>
<td>-0.18</td>
<td>3.18</td>
<td>0.94</td>
<td>-0.21</td>
</tr>
<tr>
<td>POS-SUK-ESA</td>
<td>3.36</td>
<td>0.89</td>
<td>-0.30</td>
<td>3.40</td>
<td>0.88</td>
<td>-0.48</td>
</tr>
<tr>
<td>PRE-ATT-ESA</td>
<td>3.27</td>
<td>1.10</td>
<td>-0.19</td>
<td>3.27</td>
<td>1.09</td>
<td>-0.32</td>
</tr>
<tr>
<td>POS-ATT-ESA</td>
<td>3.44</td>
<td>1.14</td>
<td>-0.25</td>
<td>3.47</td>
<td>1.13</td>
<td>-0.46</td>
</tr>
<tr>
<td>PRE-INT-ESA</td>
<td>3.44</td>
<td>1.10</td>
<td>-0.32</td>
<td>3.48</td>
<td>1.15</td>
<td>-0.40</td>
</tr>
<tr>
<td>POS-INT-ESA</td>
<td>3.59</td>
<td>1.14</td>
<td>-0.46</td>
<td>3.53</td>
<td>1.11</td>
<td>-0.34</td>
</tr>
</tbody>
</table>

Note. Data in the table is based on five-point Likert scales (1-strongly disagree, 5-strongly agree).

*aThe corresponding post-$M$ is lower than the pre-$M$.

In this study, Pearson’s correlations were calculated, and $t$-tests were conducted to test the hypotheses. Correlations and $t$-tests were used based on an assumption of normality of the variables (Ghasemi & Zahediasl, 2012). Thus, the skewness ($z$) of the variables was calculated, and the results are in Table 4.6. All variables in Table 4.6 are considered to be normally distributed since the ESA-H and ESA-W samples are medium-sized ($50 < N < 300$), and all absolute $z$-values are much smaller than 3.29 (Kim, 2013).

Socially Sustainable Apparel (SSA).

Descriptive Statistics of OBK-SSA and SUK-SSA Items. The mean scores and standard deviations of all items regarding the two constructs, including objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA), were calculated, and are presented in Table 4.7. For the SSA-H group, the mean score before communication (pre-$M$) is lower than the mean score after communication (post-$M$) on five of the eight (63%) OBK-SSA items. The pre-$M$ of each of the other three items (OBK-SSA...
3, 6, 7), as notated in Table 4.7, is not lower than the post-\( M \). Hence, participants’ knowledge levels regarding these three items did not increase after reading the information on SSA hangtags. Additionally, pre- versus post-mean scores increase on all items of consumers’ SUK-SSA. Therefore, consumers’ SUK-SSA increased after reading the information on hangtags.

Similarly, for the SSA-W group, the mean score before communication (pre-\( M \)) is lower than the mean score after communication (post-\( M \)) on half of the eight OBK-SSA items. The pre-\( M \) of each of the other four items (OBK-SSA 2, 4, 6, 7), as noted in Table 4.5, is not lower than the post-\( M \). Thus, participants did not have greater knowledge regarding the four items after reading the information on SSA webpages. Additionally, pre- versus post-mean scores did not increase on one of the three (33\%) SUK-SSA items. This item, SUK-SSA2, was related to textile and apparel workers, specifically “I am familiar with the issues related to workers in the textile and apparel industry.”

The OBK-SSA items mentioned above (OBK-SSA 2, 3, 4, 6, and 7) were related to wage, work hours, working condition safety, adoption of codes of conduct, and animal cruelty issues, respectively (see Table 4.3 for the specific items and details). Hence, participants were not effectively educated regarding these subjects by reading the relevant information on SSA hangtags and webpages.
Table 4.7

Participants’ Objective and Subjective Knowledge of SSA

<table>
<thead>
<tr>
<th>Item</th>
<th>SSA-H</th>
<th>SSA-W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre- M</td>
<td>Pre-SD</td>
</tr>
<tr>
<td>OBK-SSA1</td>
<td>3.14</td>
<td>1.28</td>
</tr>
<tr>
<td>OBK-SSA2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.48</td>
<td>1.19</td>
</tr>
<tr>
<td>OBK-SSA3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.57</td>
<td>1.15</td>
</tr>
<tr>
<td>OBK-SSA4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.61</td>
<td>1.19</td>
</tr>
<tr>
<td>OBK-SSA5</td>
<td>3.54</td>
<td>1.15</td>
</tr>
<tr>
<td>OBK-SSA6&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.57</td>
<td>1.16</td>
</tr>
<tr>
<td>OBK-SSA7&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>3.24</td>
<td>1.25</td>
</tr>
<tr>
<td>OBK-SSA8</td>
<td>3.24</td>
<td>1.00</td>
</tr>
<tr>
<td>SUK-SSA1</td>
<td>3.19</td>
<td>1.15</td>
</tr>
<tr>
<td>SUK-SSA2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.29</td>
<td>1.15</td>
</tr>
<tr>
<td>SUK-SSA3</td>
<td>3.20</td>
<td>1.14</td>
</tr>
</tbody>
</table>

Note. Data in the table is based on five-point Likert scales (1-strongly disagree, 5-strongly agree). Pre-<i>M</i> is the mean score of the corresponding item before communication, and Post-<i>M</i> is the mean score of the related item after communication.

<sup>a</sup>For the SSA-H group, pre-<i>M</i> is not lower than post-<i>M</i>

<sup>b</sup>For the SSA-W group, pre-<i>M</i> is not lower than post-<i>M</i>

The scores for the OBK-SSA items were summed and averaged to obtain the score for the OBK-SSA construct. For the SSA-H group, the mean score for the construct of OBK-SSA before communication is 3.30 (pre-<i>M</i>). Comparing the pre-<i>M</i> of the OBK-SSA construct with the pre-<i>M</i> of the OBK-SSA items (Table 4.7), it was found that there were half of the eight OBK-SSA items whose pre-<i>M</i> was lower than the pre-<i>M</i> of the OBK-SSA construct. The four items were OBK-SSA 1, 6, 7 and 8.

For the SSA-W group, the mean score for the construct of OBK-SSA before communication is 3.37 (pre-<i>M</i>). Comparing the pre-<i>M</i> of the OBK-SSA construct with the pre-<i>M</i>
of the OBK-SSA items (Table 4.7), it was found that there were half of the eight OBK-SSA items whose pre-$M$ were lower than the pre-$M$ of the OBK-SSA construct. The four items were OBK-SSA 1, 6, 7, and 8.

The OBK-SSA items mentioned above (OBK-SSA 1, 6, 7, and 8) were related to the use of child labor, adoption of codes of conducts, animal cruelty issues, adoption of socially sustainable certifications, respectively (see Table 4.3 for the specific items). Thus, participants were less knowledgeable about these subjects than about the other subjects in the questionnaire.

In general, for both the SSA-H and SSA-W groups, participants’ knowledge of the two items (OBK-SSA 6, 7) was relatively low. Additionally, their knowledge levels regarding the two items did not increase after communication. These two items were related to the adoption of codes of conduct and the issues of animal cruelty in the textile and apparel industry. Hence, it may be challenging to effectively educate consumers regarding these subjects via hangtags and product webpages.

**Descriptive Statistics of OBK-SSA, SUK-SSA, ATT-SSA, and INT-SSA Constructs.**

Descriptive statistics of the constructs, including objective knowledge (OBK), subjective knowledge (SUK), attitudes (ATT), and intentions (INT) toward SSA before and after reading the information of SSA provided via hangtags and product webpages are presented in Table 4.8. The constructs were used as variables in this study to test hypotheses. The mean scores of all variables increased after communication. Therefore, for the SSA-H and SSA-W groups, participants’ OBK-SSA and SUK-SSA were greater after reading the information on hangtags and webpages. Their attitudes toward the impacts of purchasing socially sustainable apparel (ATT-SSA) were more positive, as the measure of attitudes increased, and their intentions to purchase socially sustainable apparel (INT-SSA) increased after communication.
Table 4.8

Participants’ Knowledge, Attitudes, and Intentions toward SSA

<table>
<thead>
<tr>
<th>Variable</th>
<th>SSA-H</th>
<th>SSA-W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>PRE-OBK-SSA</td>
<td>3.30</td>
<td>0.61</td>
</tr>
<tr>
<td>POS-OBK-SSA</td>
<td>3.32</td>
<td>0.62</td>
</tr>
<tr>
<td>PRE-SUK-SSA</td>
<td>3.23</td>
<td>0.97</td>
</tr>
<tr>
<td>POS-SUK-SSA</td>
<td>3.34</td>
<td>0.92</td>
</tr>
<tr>
<td>PRE-ATT-SSA</td>
<td>3.39</td>
<td>1.15</td>
</tr>
<tr>
<td>POS-ATT-SSA</td>
<td>3.51</td>
<td>1.07</td>
</tr>
<tr>
<td>PRE-INT-SSA</td>
<td>3.54</td>
<td>1.08</td>
</tr>
<tr>
<td>POS-INT-SSA</td>
<td>3.66</td>
<td>1.04</td>
</tr>
</tbody>
</table>

Note. Data in the table is based on five-point Likert scales (1-strongly disagree, 5-strongly agree).

The skewness of the OBK-SSA, SUK-SSA, ATT-SSA, and INT-SSA variables was calculated to examine the assumption of normality (Kim, 2013). All variables in Table 4.8 are considered to be normally distributed as the SSA-H and SSA-W samples are medium-sized (50 < N < 300), and all absolute z-values are much smaller than 3.29 (Kim, 2013).
Hypothesis Testing Results

In this study, three groups of hypotheses were developed based on the literature related to consumer knowledge, the theory of planned behavior, and the effects of communication. These hypotheses were tested to investigate consumers’ knowledge of sustainable apparel and the effects of communication. Hypothesis testing results are reported in the following sections, including Hypothesis Group One: Consumer Knowledge (H1-H4) (pp.114-117), Hypothesis Group Two: The Theory of Planned Behavior (H5-H10) (pp.117-123), and Hypothesis Group Three: Effects of Communication (H11-H28) (pp.123-134).

**Hypothesis Group One: Consumer Knowledge (H1-H4)**

**Comparison between Objective and Subjective Knowledge (H1 and H2).** Four paired $t$-tests were performed to test each of the two hypotheses. H1 examined the difference between consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and subjective knowledge of environmentally sustainable apparel (SUK-ESA), and H2 examined the difference between consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA). The paired $t$-test results are outlined in Table 4.9.

H1. Consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and subjective knowledge of environmentally sustainable apparel (SUK-ESA) are not equal.

H2. Consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA) are not equal.
Table 4.9

Comparison between Objective and Subjective Knowledge (H1 and H2)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>ESA-H</td>
<td>PRE-OBK-ESA, PRE-SUK-ESA</td>
<td>-0.054</td>
<td>1.031</td>
<td>177</td>
<td>-0.70</td>
<td>.242</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-ESA, POS-SUK-ESA</td>
<td>-0.174</td>
<td>0.940</td>
<td>177</td>
<td>-2.47</td>
<td>.008*</td>
</tr>
<tr>
<td></td>
<td>ESA-W</td>
<td>PRE-OBK-ESA, PRE-SUK-ESA</td>
<td>-0.025</td>
<td>0.941</td>
<td>206</td>
<td>-0.39</td>
<td>.349</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-ESA, POS-SUK-ESA</td>
<td>-0.270</td>
<td>0.859</td>
<td>206</td>
<td>-4.52</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>H2</td>
<td>SSA-H</td>
<td>PRE-OBK-SSA, PRE-SUK-SSA</td>
<td>0.674</td>
<td>0.953</td>
<td>191</td>
<td>0.98</td>
<td>.164</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-SSA, POS-SUK-SSA</td>
<td>-0.022</td>
<td>0.861</td>
<td>191</td>
<td>-0.36</td>
<td>.361</td>
</tr>
<tr>
<td></td>
<td>SSA-W</td>
<td>PRE-OBK-SSA, PRE-SUK-SSA</td>
<td>0.003</td>
<td>0.916</td>
<td>124</td>
<td>0.04</td>
<td>.486</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-SSA, POS-SUK-SSA</td>
<td>-0.051</td>
<td>0.867</td>
<td>124</td>
<td>-0.65</td>
<td>.258</td>
</tr>
</tbody>
</table>

*Significant at $p < .05$

**H1 Testing Results.** For the ESA-H group (ESA information was provided through hangtags), consumers’ objective knowledge of environmentally sustainable apparel before communication (PRE-OBK-ESA) and subjective knowledge of environmentally sustainable apparel before communication (PRE-SUK-ESA) were not significantly different. However, their OBK-ESA after communication (POS-OBK-ESA) was significantly less than their SUK-ESA after communication (POS-SUK-ESA). Similarly, for the ESA-W group (ESA information was provided through product webpages), there was no significant difference between consumers’ PRE-OBK-ESA and PRE-SUK-ESA. However, participants’ POS-OBK-ESA was significantly less than their POS-SUK-ESA. Therefore, H1 was accepted for consumers’ OBK-ESA and SUK-ESA after communication but rejected for consumers’ OBK-ESA and SUK-ESA before communication. Expressly, consumers’ POS-OBK-ESA were significantly less than their POS-SUK-ESA, while their PRE-OBK-ESA was not significantly different from PRE-SUK-ESA.

**H2 Testing Results.** For the SSA-H (SSA information was provided through hangtags) and SSA-W (SSA information was provided through product webpages) groups, participants’ is the mean difference ($M$).
objective knowledge of socially sustainable apparel before communication (PRE-OBK-SSA) and subjective knowledge of socially sustainable apparel before communication (PRE-SUK-SSA) were not significantly different. Additionally, there was no significant difference between participants’ OBK-SSA after communication (POS-OBK-SSA) and SUK-SSA after communication (POS-SUK-SSA), either. Therefore, H2 was rejected.

**Correlations between Objective and Subjective Knowledge (H3 and H4).** H3 and H4 examined the positive relationships between consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and subjective knowledge of environmentally sustainable apparel (SUK-ESA), and between consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA), respectively. Hence, Pearson’s correlations ($r$) were utilized to test the two hypotheses (Benesty et al., 2009). Four $r$-values were calculated to test each hypothesis (Table 4.10).

**H3.** Consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and subjective knowledge of environmentally sustainable apparel (SUK-ESA) are positively correlated.

**H4.** Consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA) are positively correlated.
Table 4.10

*Correlations between Objective and Subjective Knowledge (H3 and H4)*

<table>
<thead>
<tr>
<th>H</th>
<th>Group</th>
<th>Variable</th>
<th>df</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3</td>
<td>ESA-H</td>
<td>PRE-OBK-ESA, PRE-SUK-ESA</td>
<td>176</td>
<td>-.05</td>
<td>.540</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-ESA, POS-SUK-ESA</td>
<td>176</td>
<td>.02</td>
<td>.756</td>
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<tr>
<td></td>
<td>ESA-W</td>
<td>PRE-OBK-ESA, PRE-SUK-ESA</td>
<td>205</td>
<td>.18</td>
<td>&lt;.001*</td>
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<tr>
<td></td>
<td></td>
<td>POS-OBK-ESA, POS-SUK-ESA</td>
<td>205</td>
<td>.24</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>H4</td>
<td>SSA-H</td>
<td>PRE-OBK-SSA, PRE-SUK-SSA</td>
<td>190</td>
<td>.34</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-SSA, POS-SUK-SSA</td>
<td>190</td>
<td>.43</td>
<td>&lt;.001*</td>
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<tr>
<td></td>
<td>SSA-W</td>
<td>PRE-OBK-SSA, PRE-SUK-SSA</td>
<td>123</td>
<td>.31</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POS-OBK-SSA, POS-SUK-SSA</td>
<td>123</td>
<td>.33</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

*Significant at p < .05

**H3 Testing Results.** For the ESA-H group, the two variables, objective knowledge of environmentally sustainable apparel before communication (PRE-OBK-ESA) and subjective knowledge of environmentally sustainable apparel before communication (PRE-SUK-ESA), were not correlated. Similarly, the two variables, OBK-ESA after communication (POS-OBK-ESA) and SUK-ESA after communication (POS-SUK-ESA), were not dependent either. Nevertheless, for the ESA-W group, there were positive correlations between PRE-OBK-ESA and PRE-SUK-ESA, and between POS-OBK-ESA and POS-SUK-ESA. Hence, H3 was rejected for the ESA-H group but accepted for the ESA-W group.

**H4 Testing Results.** For the SSA-H and SSA-W groups, participants’ objective knowledge of socially sustainable apparel before communication (PRE-OBK-SSA) and subjective knowledge of socially sustainable apparel before communication (PRE-SUK-SSA) were positively associated. Moreover, the relationship between consumers’ OBK-SSA after communication (POS-OBK-SSA) and SUK-SSA after communication (POS-SUK-SSA) was also positive. Therefore, H4 was accepted.
**Hypothesis Group Two: The Theory of Planned Behavior (H5-H10)**

**Correlations between Knowledge and Attitudes (H5a, H5b, H6a, and H6b).**  
H5a and H5b examined the positive correlations between consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and attitudes toward the impact of purchasing ESA (ATT-ESA), and between consumers’ subjective knowledge of ESA (SUK-ESA) and ATT-ESA, respectively. Similarly, H6a and H6b investigated the positive correlations between consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and attitudes toward the impact of purchasing SSA (ATT-SSA), and between consumers’ subjective knowledge of SSA (SUK-SSA) and ATT-SSA, respectively. Thus, Pearson’s correlations ($r$) were calculated to test the two groups of hypotheses, see Table 4.11.

**H5a. Consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and attitudes toward the impact of purchasing ESA (ATT-ESA) are positively correlated.**

**H5b. Consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) and ATT-ESA are positively correlated.**

**H6a. Consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and attitudes toward the impact of purchasing SSA (ATT-SSA) are positively correlated.**

**H6b. Consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) and ATT-SSA are positively correlated.**
Table 4.11

Correlations between Knowledge and Attitudes (H5a, H5b, H6a, and H6b)

<table>
<thead>
<tr>
<th>H</th>
<th>Group</th>
<th>Variable</th>
<th>df</th>
<th>r</th>
<th>p</th>
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<tr>
<td></td>
<td>ESA-H</td>
<td>PRE-OBK-ESA, PRE-ATT-ESA</td>
<td>176</td>
<td>.30</td>
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<tr>
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<td>POS-OBK-ESA, POS-ATT-ESA</td>
<td>176</td>
<td>.33</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>ESA-W</td>
<td>PRE-OBK-ESA, PRE-ATT-ESA</td>
<td>205</td>
<td>.25</td>
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<td>POS-OBK-ESA, POS-ATT-ESA</td>
<td>205</td>
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<td>PRE-SUK-ESA, PRE-ATT-ESA</td>
<td>176</td>
<td>.31</td>
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<td></td>
<td>POS-SUK-ESA, POS-ATT-ESA</td>
<td>205</td>
<td>.44</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>H5b</td>
<td>SSA-H</td>
<td>PRE-OBK-SSA, PRE-ATT-SSA</td>
<td>190</td>
<td>.50</td>
<td>&lt;.001*</td>
</tr>
<tr>
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<td></td>
<td>POS-OBK-SSA, POS-ATT-SSA</td>
<td>190</td>
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<tr>
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<td>SSA-W</td>
<td>PRE-OBK-SSA, PRE-ATT-SSA</td>
<td>123</td>
<td>.52</td>
<td>&lt;.001*</td>
</tr>
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<td></td>
<td>POS-OBK-SSA, POS-ATT-SSA</td>
<td>123</td>
<td>.41</td>
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</tr>
<tr>
<td>H6a</td>
<td>SSA-H</td>
<td>PRE-SUK-SSA, PRE-ATT-SSA</td>
<td>190</td>
<td>.45</td>
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</tr>
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<td>POS-SUK-SSA, POS-ATT-SSA</td>
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<td>.53</td>
<td>&lt;.001*</td>
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<td>SSA-W</td>
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</tr>
<tr>
<td></td>
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<td>POS-SUK-SSA, POS-ATT-SSA</td>
<td>123</td>
<td>.53</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

*Significant at p < .05

**H5a Testing Results.** For the ESA-H and ESA-W groups, participants’ OBK-ESA before reading the ESA information on hangtags or webpages (PRE-OBK-ESA) and ATT-ESA before communication (PRE-ATT-ESA) were positively correlated. Moreover, the association between participants’ OBK-ESA after communication (POS-OBK-ESA) and ATT-ESA after communication (POS-ATT-ESA) was also positive. Therefore, the positive relationship between OBK-ESA and ATT-ESA was confirmed, and H5a was accepted.

**H5b Testing Results.** For the two ESA groups, participants’ SUK-ESA before communication (PRE-SUK-ESA) and PRE-ATT-ESA were positively correlated. Additionally, there was a positive association between consumers’ SUK-ESA after communication (POS-SUK-ESA) and POS-ATT-ESA. The positive correlation between SUK-ESA and ATT-ESA was supported, and H5b was accepted.
**H6a Testing Results.** For the SSA-H and SSA-W groups, consumers’ OBK-SSA before reading the SSA information (PRE-OBK-SSA) and ATT-SSA before communication (PRE-ATT-SSA) were positively correlated. There was also a positive correlation between consumers’ OBK-SSA after communication (POS-OBK-SSA) and ATT-SSA after communication (POS-ATT-SSA). Overall, consumers’ OBK-SSA and ATT-SSA were moderately correlated (.30 < r < .70). Thus, H6a was accepted.

**H6b Testing Results.** For the two SSA groups, participants’ SUK-SSA before communication (PRE-SUK-SSA) and PRE-ATT-SSA were positively correlated. Additionally, SUK-SSA after communication (POS-SUK-SSA) and POS-ATT-SSA were also positively associated. Thus, the positive correlation between SUK-SSA and ATT-SSA was supported, and H6b was accepted.

**Correlations between Knowledge and Intentions (H7a, H7b, H8a, and H8b).** H7 and H7b examined the positive relationship between consumers’ knowledge of ESA and intentions to purchase ESA (INT-ESA), with H7a focusing on objective knowledge of ESA (OBK-ESA) and H7b focusing on subjective knowledge of ESA (SUK-ESA). Additionally, H8a and H8b investigated the positive association between consumers’ knowledge of SSA and intentions to purchase SSA (INT-SSA), with H8a concentrating on objective knowledge of SSA (OBK-SSA) and H8b focusing on subjective knowledge of SSA (SUK-SSA). Pearson’s correlations (r) were used to test the two groups of hypotheses (Table 4.12).

H7a. Consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) and intentions to purchase environmentally sustainable apparel (INT-ESA) are positively correlated.
H7b. Consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) and INT-ESA are positively correlated.

H8a. Consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and intentions to purchase socially sustainable apparel (INT-SSA) are positively correlated.

H8b. Consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) and INT-SSA are positively correlated.

Table 4.12

Correlations between Knowledge and Intentions (H7a, H7b, H8a, and H8b)

<table>
<thead>
<tr>
<th></th>
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<th>Variable</th>
<th>df</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
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<td>H7a ESA-H</td>
<td>PRE-OBK-ESA, PRE-INT-ESA</td>
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<td>.21</td>
<td>&lt;.005*</td>
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<tr>
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<td>PRE-OBK-ESA, PRE-INT-ESA</td>
<td>205</td>
<td>.36</td>
<td>&lt;.001*</td>
<td></td>
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<tr>
<td></td>
<td>POS-OBK-ESA, POS-INT-ESA</td>
<td>205</td>
<td>.33</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>H7b ESA-H</td>
<td>PRE-SUK-ESA, PRE-INT-ESA</td>
<td>176</td>
<td>.44</td>
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<td></td>
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<tr>
<td></td>
<td>POS-SUK-ESA, POS-INT-ESA</td>
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<td>PRE-SUK-ESA, PRE-INT-ESA</td>
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<td>.47</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POS-SUK-ESA, POS-INT-ESA</td>
<td>205</td>
<td>.51</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>H8a SSA-H</td>
<td>PRE-OBK-SSA, PRE-INT-SSA</td>
<td>190</td>
<td>.48</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POS-OBK-SSA, POS-INT-SSA</td>
<td>190</td>
<td>.52</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRE-OBK-SSA, PRE-INT-SSA</td>
<td>123</td>
<td>.44</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POS-OBK-SSA, POS-INT-SSA</td>
<td>123</td>
<td>.37</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>H8b SSA-H</td>
<td>PRE-SUK-SSA, PRE-INT-SSA</td>
<td>190</td>
<td>.48</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POS-SUK-SSA, POS-INT-SSA</td>
<td>190</td>
<td>.52</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRE-SUK-SSA, PRE-INT-SSA</td>
<td>123</td>
<td>.42</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>POS-SUK-SSA, POS-INT-SSA</td>
<td>123</td>
<td>.56</td>
<td>&lt;.001*</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at p < .05

**H7a Testing Results.** For the two ESA groups in Table 4.12, the correlation coefficient of OBK-ESA before communication (PRE-OBK-ESA) and INT-ESA before communication (PRE-INT-ESA) showed a positive association between the two variables. Similarly, the association between OBK-ESA after communication (POS-OBK-ESA) and INT-ESA after communication (POS-INT-ESA) was also positive. Thus, a positive correlation between OBK-ESA and INT-ESA was identified, and H7a was accepted.
**H7b Testing Results.** For the ESA-H and ESA-W groups, participants’ SUK-ESA before communication (PRE-SUK-ESA) and PRE-INT-ESA were positively correlated. Additionally, there was a positive association between consumers’ SUK-ESA after communication (POS-SUK-ESA) and POS-INT-ESA. It was confirmed that the positive correlation between SUK-ESA and INT-ESA was significant, and H7b was accepted.

**H8a Testing Results.** For the two SSA groups in Table 4.12, consumers’ OBK-SSA before communication (PRE-OBK-SSA) and INT-SSA before communication (PRE-INT-SSA) were positively correlated. Moreover, there was also a positive correlation between consumers’ OBK-SSA after communication (POS-OBK-SSA) and INT-SSA after communication (POS-INT-SSA). In general, consumers’ OBK-SSA and INT-SSA were positively associated, and H8a was accepted.

**H8b Testing Results.** Results regarding H8b in Table 4.12 showed that participants’ SUK-SSA before communication (PRE-SUK-SSA) and PRE-INT-SSA were positively correlated. Additionally, the positive correlation between SUK-SSA after communication (POS-SUK-SSA) and POS-ATT-SSA was confirmed. Thus, the correlation between SUK-SSA and INT-SSA was significantly positive, and H8b was accepted.

**Correlations between Attitudes and Intentions (H9 and H10).** H9 and H10 investigated the relationships between consumers’ ATT-ESA and INT-ESA, and between ATT-SSA and INT-SSA, accordingly. Pearson’s correlations ($r$) were utilized to test the hypotheses. The analysis results are presented in Table 4.13.

H9. Consumers’ attitudes toward the impact of purchasing environmentally sustainable apparel (ATT-ESA) and intentions to purchase environmentally sustainable apparel (INT-ESA) are positively correlated.
H10. Consumers’ attitudes toward the impact of purchasing socially sustainable apparel (ATT-SSA) and intentions to purchase socially sustainable apparel (INT-SSA) are positively correlated.

Table 4.13

*Correlations between Attitudes and Intentions (H9 and H10)*

<table>
<thead>
<tr>
<th>H</th>
<th>Group</th>
<th>Variable</th>
<th>df</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
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<td>H9</td>
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<td>PRE-ATT-ESA, PRE-INT-ESA</td>
<td>176</td>
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<tr>
<td></td>
<td></td>
<td>POS-ATT-ESA, POS-INT-ESA</td>
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<td>.51</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>ESA-W</td>
<td>PRE-ATT-ESA, PRE-INT-ESA</td>
<td>205</td>
<td>.46</td>
<td>&lt;.001*</td>
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<tr>
<td></td>
<td></td>
<td>POS-ATT-ESA, POS-INT-ESA</td>
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<td>&lt;.001*</td>
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<tr>
<td>H10</td>
<td>SSA-H</td>
<td>PRE-ATT-SSA, PRE-INT-SSA</td>
<td>190</td>
<td>.59</td>
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<tr>
<td></td>
<td></td>
<td>POS-ATT-SSA, POS-INT-SSA</td>
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<td>.59</td>
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<td>PRE-ATT-SSA, PRE-INT-SSA</td>
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<td>POS-ATT-SSA, POS-INT-SSA</td>
<td>123</td>
<td>.48</td>
<td>&lt;.001*</td>
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</tbody>
</table>

*Significant at p < .05

**H9 Testing Results.** For the ESA-H and ESA-W groups, the two variables, ATT-ESA before communication (PRE-ATT-ESA) and INT-ESA before communication (PRE-INT-ESA), were positively associated. Similarly, the correlation between ATT-ESA after communication (POS-ATT-ESA) and INT-ESA after communication (POS-INT-ESA) was also significantly positive. Thus, the positive correlation between ATT-ESA and INT-ESA was confirmed, and H9 was accepted.

**H10 Testing Results.** For the two SSA groups in Table 4.13, consumers’ ATT-SSA before communication (PRE-ATT-SSA) and INT-SSA before communication (PRE-INT-SSA) were positively correlated. Moreover, there was also a positive correlation between consumers’ ATT-SSA after communication (POS-ATT-SSA) and INT-SSA after communication (POS-INT-SSA). Overall, consumers’ ATT-SSA and INT-SSA were positively associated, and H10 was accepted.
Hypothesis Group Three: Effects of Communication (H11-H28)

Effects of Communication on Knowledge (H11a, H11b, H12a, H12b, H13a, H13b, H14a, and H14b). These hypotheses investigated the impact of communication on consumers’ knowledge about sustainable apparel. Specifically, H11a and H11b focused on the effects of hangtags on consumers’ knowledge of ESA, H12a and H12b examined the impacts of hangtags on consumers’ knowledge of SSA, H13a and H13b concentrated on the impact of product webpages on consumers’ knowledge of ESA, and H14a and H14b investigated the effects of product webpages on consumers’ knowledge of SSA. Paired t-tests were conducted to test the hypotheses (Table 4.14).

H11a. The use of hangtags to communicate with consumers on environmentally sustainable apparel (ESA) will increase consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA).

H11b. The use of hangtags to communicate with consumers on ESA will increase consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA).

H12a. The use of hangtags to communicate with consumers on socially sustainable apparel (SSA) will increase consumers’ objective knowledge of socially sustainable apparel (OBK-SSA).

H12b. The use of hangtags to communicate with consumers on SSA will increase consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA).

H13a. The use of product webpages to communicate with consumers on ESA will increase consumers’ OBK-ESA.

H13b. The use of product webpages to communicate with consumers on ESA will increase consumers’ SUK-ESA.
H14a. The use of product webpages to communicate with consumers on SSA will increase consumers’ OBK-SSA.

H14b. The use of product webpages to communicate with consumers on SSA will increase consumers’ SUK-SSA.

Table 4.14

Coding and Analysis Results regarding the Effects of Communication on Knowledge (H11a, H11b, H12a, H12b, H13a, H13b, H14a, and H14b)

<table>
<thead>
<tr>
<th></th>
<th>Group</th>
<th>Variable</th>
<th>Coding</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>H11a</td>
<td>ESA-H</td>
<td>POS-OBK-ESA, PRE-OBK-ESA</td>
<td>EFF-OBK-ESA-H</td>
<td>0.030</td>
<td>0.319</td>
<td>177</td>
<td>1.25</td>
<td>.107</td>
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<tr>
<td>H11b</td>
<td>ESA-H</td>
<td>POS-SUK-ESA, PRE-SUK-ESA</td>
<td>EFF-SUK-ESA-H</td>
<td>0.150</td>
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<td>177</td>
<td>2.32</td>
<td>.011*</td>
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<tr>
<td>H12a</td>
<td>SSA-H</td>
<td>POS-OBK-SSA, PRE-OBK-SSA</td>
<td>EFF-OBK-SSA-H</td>
<td>0.025</td>
<td>0.438</td>
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<td>0.79</td>
<td>.214</td>
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<tr>
<td>H12b</td>
<td>SSA-H</td>
<td>POS-SUK-SSA, PRE-SUK-SSA</td>
<td>EFF-SUK-SSA-H</td>
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<td>0.749</td>
<td>191</td>
<td>2.12</td>
<td>.018*</td>
</tr>
<tr>
<td>H13a</td>
<td>ESA-W</td>
<td>POS-OBK-ESA, PRE-OBK-ESA</td>
<td>EFF-OBK-ESA-W</td>
<td>-0.024</td>
<td>0.320</td>
<td>206</td>
<td>-1.08</td>
<td>.360</td>
</tr>
<tr>
<td>H13b</td>
<td>ESA-W</td>
<td>POS-SUK-ESA, PRE-SUK-ESA</td>
<td>EFF-SUK-ESA-W</td>
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<td>0.873</td>
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<td>3.64</td>
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<tr>
<td>H14a</td>
<td>SSA-W</td>
<td>POS-OBK-SSA, PRE-OBK-SSA</td>
<td>EFF-OBK-SSA-W</td>
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<td>0.484</td>
<td>124</td>
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<td>.490</td>
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<tr>
<td>H14b</td>
<td>SSA-W</td>
<td>POS-SUK-SSA, PRE-SUK-SSA</td>
<td>EFF-SUK-SSA-W</td>
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<td>0.777</td>
<td>124</td>
<td>0.79</td>
<td>.217</td>
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</table>

Note. The score of the variable after communication (POS) minus the score of the corresponding variable before communication (PRE) is the mean difference (M).

*Significant at p < .05

H11a Testing Results. The paired *t*-test analysis of consumers’ OBK-ESA before reading the ESA information on hangtags (PRE-OBK-ESA) and OBK-ESA after communication (POS-OBK-ESA), outlined in Table 4.14, showed a non-significant increase in participants’ OBK-ESA after communication. Thus, H11a was rejected.
**H11b Testing Results.** Consumers’ SUK-ESA after reading the information on hangtags (POS-SUK-ESA) was significantly higher than their SUK-ESA before reading the information (PRE-SUK-ESA). Therefore, using hangtags to communicate with consumers on ESA did increase consumers’ SUK-ESA, and H11b was accepted.

**H12a Testing Results.** The paired t-test result of participants’ OBK-SSA before reading the SSA hangtags (PRE-OBK-SSA) and OBK-SSA after communication (POS-OBK-SSA), reported in Table 4.14, was a non-significant increase in participants’ OBK-SSA after communication. Thus, H12a was rejected.

**H12b Testing Results.** Participants’ SUK-SSA after communication via hangtags (POS-SUK-SSA) was significantly more than their SUK-SSA before communication (PRE-SUK-SSA). Hence, using hangtags to communicate with consumers on SSA did increase consumers’ SUK-SSA, and H12b was accepted.

**H13a Testing Results.** Consumers’ OBK-ESA did not significantly increase after reading the information on ESA product webpages. Thus, H13a was rejected.

**H13b Testing Results.** Consumers’ SUK-ESA significantly increased after reading the information on ESA product webpages. Therefore, the positive effects of webpages on consumers’ SUK-ESA were confirmed, and H13b was accepted.

**H14a Testing Results.** Participants’ OBK-SSA did not significantly increase after reading the information on SSA product webpages. Thus, H14a was rejected.

**H14b Testing Results.** Participants’ SUK-SSA did not significantly increase after reading the information on SSA product webpages. Hence, using webpages to communicate with consumers on SSA did not increase consumers’ SUK-SSA, and H14b was rejected.
**Effects of Communication on Attitudes (H15, H16, H17, and H18).** These hypotheses examined the effects of communication on consumers’ attitudes toward the impact of purchasing sustainable apparel. Specifically, H15 and H16 focused on consumers’ attitudes toward the impact of purchasing ESA, while H17 and H18 examined the effects of communication on consumers’ attitudes toward the impact of purchasing SSA. Paired t-tests were performed to analyze the hypotheses (Table 4.15).

**H15.** The use of hangtags to communicate with consumers on environmentally sustainable apparel (ESA) will make consumers’ attitudes toward the impact of purchasing environmentally sustainable apparel (ATT-ESA) more positive.

**H16.** The use of product webpages to communicate with consumers on ESA will make consumers’ ATT-ESA more positive.

**H17.** The use of hangtags to communicate with consumers on socially sustainable apparel (SSA) will make consumers’ attitudes toward the impact of purchasing socially sustainable apparel (ATT-SSA) more positive.

**H18.** The use of product webpages to communicate with consumers on SSA will make consumers’ ATT-SSA more positive.
### Table 4.15

**Coding and Analysis Results regarding the Effects of Communication on Attitudes (H15, H16, H17, and H18)**

<table>
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<th>Group</th>
<th>Variable</th>
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<th>SD</th>
<th>df</th>
<th>t</th>
<th>p</th>
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</thead>
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<td>H15</td>
<td>ESA-H</td>
<td>POS-ATT-ESA, PRE-ATT-ESA</td>
<td>EFF-ATT-ESA-H</td>
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<td>177</td>
<td>1.87</td>
<td>.031*</td>
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<tr>
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<td>ESA-W</td>
<td>POS-ATT-ESA, PRE-ATT-ESA</td>
<td>EFF-ATT-ESA-W</td>
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<td>1.250</td>
<td>206</td>
<td>2.29</td>
<td>.012*</td>
</tr>
<tr>
<td>H17</td>
<td>SSA-H</td>
<td>POS-ATT-SSA, PRE-ATT-SSA</td>
<td>EFF-ATT-SSA-H</td>
<td>0.131</td>
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<td>.057</td>
</tr>
<tr>
<td>H18</td>
<td>SSA-W</td>
<td>POS-ATT-SSA, PRE-ATT-SSA</td>
<td>EFF-ATT-SSA-W</td>
<td>0.065</td>
<td>1.200</td>
<td>124</td>
<td>0.60</td>
<td>.274</td>
</tr>
</tbody>
</table>

*Note.* The score of the variable after communication (POS) minus the score of the corresponding variable before communication (PRE) is the mean difference (M).

*Significant at $p < .05$

**H15 Testing Results.** The paired $t$-test analysis of consumers’ ATT-ESA before reading the information on ESA hangtags (PRE-ATT-ESA) and ATT-ESA after communication (POS-ATT-ESA), outlined in Table 4.15, showed a significant increase in participants’ ATT-ESA after communication. Thus, H15 was accepted.

**H16 Testing Results.** Participants’ ATT-ESA significantly increased after reading the information on ESA product webpages. Thus, H16 was accepted.

**H17 Testing Results.** The paired $t$-test result of consumers’ ATT-SSA before reading the information on SSA hangtags (PRE-ATT-SSA) and ATT-SSA after communication (POS-ATT-SSA), presented in Table 4.15, was a non-significant increase in participants’ ATT-SSA after communication. Thus, H17 was rejected.

**H18 Testing Results.** Participants’ ATT-SSA did not significantly increase after reading the information on SSA product webpages. Hence, H18 was rejected.
Effects of Communication on Intentions (H19, H20, H21, and H22). These four hypotheses examined the effects of communication via hangtags and webpages on consumers’ intentions to purchase sustainable apparel. H19 and H20 concentrated on consumers’ intentions to purchase ESA, while H21 and H22 investigated the impact of communication on consumers’ intentions to purchase SSA. Paired t-tests were utilized to test the hypotheses (Table 4.16).

H19. The use of hangtags to communicate with consumers on environmentally sustainable apparel (ESA) will increase consumers’ intentions to purchase environmentally sustainable apparel (INT-ESA).

H20. The use of product webpages to communicate with consumers on ESA will increase consumers’ INT-ESA.

H21. The use of hangtags to communicate with consumers on socially sustainable apparel (SSA) will increase consumers’ intentions to purchase socially sustainable apparel (INT-SSA).

H22. The use of product webpages to communicate with consumers on SSA will increase consumers’ INT-SSA.
Table 4.16

**Coding and Analysis Results regarding the Effects of Communication on Intentions (H19, H20, H21, and H22)**

<table>
<thead>
<tr>
<th>H</th>
<th>Group</th>
<th>Variable</th>
<th>Coding</th>
<th>M</th>
<th>SD</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>H19</td>
<td>ESA-H</td>
<td>POS-INT-ESA, PRE-INT-ESA</td>
<td>EFF-INT-ESA-H</td>
<td>0.153</td>
<td>1.071</td>
<td>177</td>
<td>1.90</td>
<td>.030*</td>
</tr>
<tr>
<td>H20</td>
<td>ESA-W</td>
<td>POS-INT-ESA, PRE-INT-ESA</td>
<td>EFF-INT-ESA-W</td>
<td>0.063</td>
<td>1.198</td>
<td>206</td>
<td>0.76</td>
<td>.225</td>
</tr>
<tr>
<td>H21</td>
<td>SSA-H</td>
<td>POS-INT-SSA, PRE-INT-SSA</td>
<td>EFF-INT-SSA-H</td>
<td>0.132</td>
<td>1.025</td>
<td>191</td>
<td>1.77</td>
<td>.039*</td>
</tr>
<tr>
<td>H22</td>
<td>SSA-W</td>
<td>POS-INT-SSA, PRE-INT-SSA</td>
<td>EFF-INT-SSA-W</td>
<td>0.122</td>
<td>1.120</td>
<td>124</td>
<td>1.21</td>
<td>.115</td>
</tr>
</tbody>
</table>

*Note.* The score of the variable after communication (POS) minus the score of the corresponding variable before communication (PRE) is the mean difference ($M$).

*Significant at $p < .05$

**H19 Testing Results.** After reading the relevant information on ESA hangtags, consumers’ INT-ESA significantly increased (Table 4.16). Thus, H19 was accepted.

**H20 Testing Results.** The results regarding H20 in Table 4.16 lead to a rejection of this hypothesis. Participants’ INT-ESA after reading the information on ESA webpages (POS-INT-ESA) was not significantly higher than their INT-ESA before communication (PRE-INT-ESA).

**H21 Testing Results.** After reading the information provided through SSA hangtags, consumers’ INT-SSA significantly increased. Thus, H21 was accepted.

**H22 Testing Results.** Participants’ INT-SSA after reading the information on SSA webpages (POS-INT-SSA) was not significantly higher than their INT-SSA before communication (PRE-INT-SSA). Hence, H22 was rejected.

**Difference in the Effects of Hangtags and Webpages (H23a, H23b, H24a, H24b, H25, H26, H27, and H28).** These hypotheses investigated the difference in the effects of communication via hangtags and product webpages. H23a, H23b, H24a, and H24b focused on
the effects of hangtags and webpages on consumers’ knowledge of sustainable apparel. H25 and H26 focused on consumers’ attitudes toward the impact of purchasing sustainable apparel, while H27 and H28 concentrated on consumers’ intentions to purchase sustainable apparel. Earlier in this chapter, 16 variables were created and coded, as shown in Table 4.14, 4.15, and 4.16. These variables were used to represent the effects of hangtags and webpages on consumers’ knowledge of sustainable apparel, attitudes toward the impact of purchasing sustainable apparel, and intentions to purchase sustainable apparel.

For example, the variable, EFF-OBK-ESA-W, represented the effects of communication via product webpages on consumers’ objective knowledge of environmentally sustainable apparel. Based on the 16 variables, eight $t$-tests were utilized to test the hypotheses (Table 4.17). In general, six of the eight (75%) mean difference is negative ($M < 0$). These results indicate that the corresponding mean scores of the variables related to hangtags are higher than that of the variables related to webpages. In other words, the effects of hangtags are greater than that of webpages. Specific hypotheses and hypothesis testing results are reported in the following paragraphs.

H23a. The effects of information regarding environmentally sustainable apparel (ESA) provided via hangtags and product webpages on consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA) are different.

H23b. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) are different.
H24a. The effects of information regarding socially sustainable apparel (SSA) provided via hangtags and product webpages on consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) are different.

H24b. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) are different.

H25. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ attitudes toward the impact of purchasing ESA (ATT-ESA) are different.

H26. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ attitudes toward the impact of purchasing SSA (ATT-SSA) are different.

H27. The effects of information regarding ESA provided via hangtags and product webpages on consumers’ intentions to purchase ESA (INT-ESA) are different.

H28. The effects of information regarding SSA provided via hangtags and product webpages on consumers’ intentions to purchase SSA (INT-SSA) are different.
Table 4.17

*Difference in the Effects of Hangtags and Webpages (H23a, H23b, H24a, H24b, H25, H26, H27, and H28)*

<table>
<thead>
<tr>
<th>H</th>
<th>Variable</th>
<th>M</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>H23a</td>
<td>EFF-OBK-ESA-W, EFF-OBK-ESA-H</td>
<td>-0.054</td>
<td>383</td>
<td>1.65</td>
<td>.049*</td>
</tr>
<tr>
<td>H23b</td>
<td>EFF-SUK-ESA-W, EFF-SUK-ESA-H</td>
<td>0.071</td>
<td>383</td>
<td>-0.80</td>
<td>.212</td>
</tr>
<tr>
<td>H24a</td>
<td>EFF-OBK-SSA-W, EFF-OBK-SSA-H</td>
<td>-0.024</td>
<td>315</td>
<td>0.46</td>
<td>.324</td>
</tr>
<tr>
<td>H24b</td>
<td>EFF-SUK-SSA-W, EFF-SUK-SSA-H</td>
<td>-0.060</td>
<td>315</td>
<td>0.69</td>
<td>.247</td>
</tr>
<tr>
<td>H25</td>
<td>EFF-ATT-ESA-W, EFF-ATT-ESA-H</td>
<td>0.046</td>
<td>383</td>
<td>-0.36</td>
<td>.359</td>
</tr>
<tr>
<td>H26</td>
<td>EFF-ATT-SSA-W, EFF-ATT-SSA-H</td>
<td>-0.015</td>
<td>315</td>
<td>0.11</td>
<td>.455</td>
</tr>
<tr>
<td>H27</td>
<td>EFF-INT-ESA-W, EFF-INT-ESA-H</td>
<td>-0.079</td>
<td>383</td>
<td>0.65</td>
<td>.259</td>
</tr>
<tr>
<td>H28</td>
<td>EFF-INT-SSA-W, EFF-INT-SSA-H</td>
<td>-0.004</td>
<td>315</td>
<td>0.03</td>
<td>.488</td>
</tr>
</tbody>
</table>

*Note. The score of the variable related to webpages (W) minus the score of the corresponding variable regarding hangtags (H) is the mean difference (M).*

*Significant at p < .05

**H23a Testing Results.** According to the t-test results of H23a in Table 4.17, the mean score of EFF-OBK-ESA-W was significantly lower than that of EFF-OBK-ESA-H. Thus, information on hangtags were more effective than that on webpages in increasing participants’ objective knowledge of environmentally sustainable apparel (OBK-ESA), and H23a was accepted.

**H23b Testing Results.** There was no significant difference between the mean scores of EFF-SUK-ESA-H and EFF-SUK-ESA-W. Hence, the effects of information provided via ESA hangtags and ESA product webpages on consumers’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) were not significantly different, and H23b was rejected.

**H24a Testing Results.** There was no significant difference between the mean scores of EFF-OBK-SSA-H and EFF-OBK-SSA-W. Therefore, the effects of information provided via SSA hangtags and SSA product webpages on consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) were not significantly different, and H24a was rejected.
**H24b Testing Results.** There was no significant difference between the mean scores of EFF-SUK-SSA-H and EFF-SUK-SSA-W. Hence, the effects of information provided via SSA hangtags and SSA product webpages on consumers’ subjective knowledge of socially sustainable apparel (SUK-SSA) were not significantly different, and H24b was rejected.

**H25 Testing Results.** There was no significant difference between the mean scores of EFF-ATT-ESA-H and EFF-ATT-ESA-W. Thus, the effects of information on ESA hangtags did not significantly vary from that of on ESA product webpages on consumers’ attitudes toward the impact of purchasing environmentally sustainable apparel (ATT-ESA), and H25 was rejected.

**H26 Testing Results.** There was no significant difference between the mean scores of EFF-ATT-SSA-H and EFF-ATT-SSA-W. Hence, the effects of communication through SSA hangtags and SSA product webpages on consumers’ attitudes toward the impact of purchasing socially sustainable apparel (ATT-SSA) were not significantly different, and H26 was rejected.

**H27 Testing Results.** There was no significant difference between the mean scores of EFF-INT-ESA-H and EFF-INT-ESA-W. Thus, the effects of communication through ESA hangtags and ESA product webpages on consumers’ intentions to purchase environmentally sustainable apparel (INT-ESA) were not significantly different, and H27 was rejected.

**H28 Testing Results.** There was no significant difference between the mean scores of EFF-INT-SSA-H and EFF-INT-SSA-W. Hence, the effects of communication through SSA hangtags and SSA product webpages on consumers’ intentions to purchase socially sustainable apparel (INT-SSA) were not significantly different, and H28 was rejected.

**Summary of Hypothesis Testing Results**

First, participants’ subjective knowledge of environmentally sustainable apparel (SUK-ESA) was significantly higher than their objective knowledge of environmentally sustainable
apparel (OBK-ESA) after reading the related information on hangtags or webpages (H1). For the ESA-W group, consumers’ OBK-ESA and SUK-ESA were positively correlated (H3). Moreover, for both the SSA-H and SSA-W groups, consumers’ objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of socially sustainable apparel (SUK-SSA) were positively associated (H4).

Second, all the hypotheses regarding the theory of planned behavior (H5-H10) were accepted. In other words, any two of the three variables, including knowledge, attitude, and intention, were positively correlated.

Third, the effects of communicating with consumers via hangtags on consumers’ SUK-ESA (H11b), SUK-SSA (H12b), attitudes toward the impact of purchasing ESA (ATT-ESA) (H15), intentions to purchase ESA (INT-ESA) (H19), and intentions to purchase SSA (INT-SSA) (H21) were confirmed. Similarly, the effects of communicating with consumers via product webpages on consumers’ SUK-ESA (H13b) and ATT-ESA (H16) were also supported.

Additionally, the effects of information regarding ESA provided via hangtags and product webpages on consumers’ OBK-ESA were significantly different, and hangtags were more effective than webpages (H23a). However, the effects of information regarding ESA or SSA provided via hangtags and webpages on consumers’ SUK-ESA (H23b), OBK-SSA (H24a), SUK-SSA (H24b), ATT-ESA (H25), ATT-SSA (H26), INT-ESA (H27), and INT-SSA (H28), are not significantly different. A summary of the hypothesis test results is shown in Table 4.18.
Table 4.18

Summary of Hypothesis Testing Results

<table>
<thead>
<tr>
<th>Group</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer knowledge</td>
<td>H1. Consumers’ OBK-ESA and SUK-ESA are not equal.</td>
<td>Accepted/Rejected&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>H2. Consumers’ OBK-SSA and SUK-SSA are not equal</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H3. Consumers’ OBK-ESA and SUK-ESA are positively correlated.</td>
<td>Accepted/Rejected&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>H4. Consumers’ OBK-SSA and SUK-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td>The Theory of planned behavior</td>
<td>H5a. Consumers’ OBK-ESA and ATT-ESA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H5b. Consumers’ SUK-ESA and ATT-ESA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H6a. Consumers’ OBK-SSA and ATT-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H6b. Consumers’ SUK-SSA and ATT-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H7a. Consumers’ OBK-ESA and INT-ESA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H7b. Consumers’ SUK-ESA and INT-ESA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H8a. Consumers’ OBK-SSA and INT-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H8b. Consumers’ SUK-SSA and INT-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H9. Consumers’ ATT-ESA and INT-ESA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H10. Consumers’ ATT-SSA and INT-SSA are positively correlated.</td>
<td>Accepted</td>
</tr>
<tr>
<td>Effects of communication</td>
<td>H11a. The use of hangtags to communicate with consumers on ESA will increase consumers’ OBK-ESA.</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H11b. The use of hangtags to communicate with consumers on ESA will improve consumers’ SUK-ESA.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H12a. The use of hangtags to communicate with consumers on SSA will increase consumers’ OBK-SSA.</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H12b. The use of hangtags to communicate with consumers on SSA will increase consumers’ SUK-SSA.</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H13a. The use of product webpages to communicate with consumers on ESA will increase consumers’ OBK-ESA.</td>
<td>Rejected</td>
</tr>
<tr>
<td>Group</td>
<td>Hypothesis</td>
<td>Result</td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
<td>--------</td>
</tr>
<tr>
<td>H13b.</td>
<td>The use of product webpages to communicate with consumers on ESA will increase consumers’ SUK-ESA.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H14a.</td>
<td>The use of product webpages to communicate with consumers on SSA will increase consumers’ OBK-SSA.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H14b.</td>
<td>The use of product webpages to communicate with consumers on SSA will increase consumers’ SUK-SSA.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H15.</td>
<td>The use of hangtags to communicate with consumers on ESA will make consumers’ ATT-ESA more positive.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H16.</td>
<td>The use of product webpages to communicate with consumers on ESA will make consumers’ ATT-ESA more positive.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H17.</td>
<td>The use of hangtags to communicate with consumers on SSA will make consumers’ ATT-SSA more positive.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H18.</td>
<td>The use of webpages to communicate with consumers on SSA will make consumers’ ATT-SSA more positive.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H19.</td>
<td>The use of hangtags to communicate with consumers on ESA will increase consumers’ INT-ESA.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H20.</td>
<td>The use of product webpages to communicate with consumers on ESA will increase consumers’ INT-ESA.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H21.</td>
<td>The use of hangtags to communicate with consumers on SSA will increase consumers’ INT-SSA.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H22.</td>
<td>The use of webpages to communicate with consumers on SSA will increase consumers’ INT-SSA.</td>
<td>Rejected</td>
</tr>
<tr>
<td>H23a.</td>
<td>The effects of information regarding ESA provided via hangtags and product webpages on consumers’ OBK-ESA are different.</td>
<td>Accepted</td>
</tr>
<tr>
<td>H23b.</td>
<td>The effects of information regarding ESA provided via hangtags and product webpages on consumers’ SUK-ESA are different.</td>
<td>Rejected</td>
</tr>
<tr>
<td>Group</td>
<td>Hypothesis</td>
<td>Result</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Effects of communication</td>
<td>H24a. The effects of information regarding SSA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ OBK-SSA are different.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H24b. The effects of information regarding SSA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ SUK-SSA are different.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H25. The effects of information regarding ESA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ ATT-ESA are different.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H26. The effects of information regarding SSA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ ATT-SSA are different.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H27. The effects of information regarding ESA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ INT-ESA are different.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H28. The effects of information regarding SSA provided via hangtags and</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>product webpages on consumers’ INT-SSA are different.</td>
<td></td>
</tr>
</tbody>
</table>

**Note.**

aH1 was accepted for POS-OBK-ESA and POS-SUK-ESA and rejected for PRE-OBK-ESA and PRE-SUK-ESA.

bH3 was accepted for the ESA-W group and rejected for the ESA-H group.
Discussion

Sustainability, as a combination of environment, society, and economy, is a complex concept, attracting increased concerns in the T/A industry. This industry is considered to be associated with many environmental issues, such as water consumption, and social issues, such as low wages. Correspondingly, this industry develops and implements various practices, such as the use of sustainable materials and fair labor, to reduce its negative environmental and social impacts.

Considering the two categories of sustainable practices, two sustainable apparel categories have been identified in this study, including environmentally sustainable apparel (ESA) and socially sustainable apparel (SSA). ESA is the apparel produced using environmentally sustainable practices, and SSA is the apparel produced under socially sustainable practices. Consumers’ knowledge of ESA and SSA, and the effects of communication on consumers’ knowledge of ESA and SSA, attitudes toward the impact of purchasing ESA and SSA, and consumers’ intentions to purchase ESA and SSA have been investigated in this study. In the following sections, the discussion of the results regarding ESA and SSA is presented. See Table 4.18 for the specific hypotheses.

Environmentally Sustainable Apparel (ESA)

Consumer Knowledge of ESA

Objective Knowledge of ESA. An instrument with 14 items was developed in the first phase of this study to assess consumers’ objective knowledge of ESA (OBK-ESA). The first nine items were related to the issues of water consumption, water pollution, carbon footprint, and waste disposal and generation. The other five items were about consumers’ inputs to the environmental issues, sustainable cotton fibers, the environmental issues of apparel products in
addition to fast fashion, the company’s commitment to reducing the negative environmental impacts, and the adoption of certifications regarding environmentally sustainable practices.

T/A solid waste is a critical issue and requires consumers’ engagement to reduce waste generation and improve the disposal process (Edgeman et al., 2015). However, the findings of this study indicate that consumers’ knowledge about waste was less than their knowledge of other items in the instrument. Specifically, consumers lacked knowledge about the negative impacts of natural fiber disposal and the large number of waste generation in the T/A industry.

Moreover, even though the related information was provided on the ESA hangtags and product webpages, consumers’ knowledge did not increase after reading the information. The findings support the results in Norum’s (2017) study that identified consumers’ lack of knowledge about post-consumer waste generation and disposal. Norum (2017) noted that even though consumers had heard of some companies’ take-back programs, they did not know the negative impacts of disposing T/A in landfills. Hence, brands and retailers should make more efforts to increase consumers’ awareness regarding the seriousness of solid waste generation and disposal in landfills, using more effective communication methods.

**Objective and Subjective Knowledge of ESA.** The equality between the measurement of consumers’ OBK-ESA and SUK-ESA is influenced by whether the information regarding ESA is provided to and read by consumers. Specifically, H1 was accepted since a significant difference in consumers’ OBK-ESA after communication (POS-OBK-ESA) and SUK-ESA after communication (POS-SUK-ESA) was found. This implies that after reading the information on hangtags or webpages, the knowledge consumers thought they had (subjective knowledge) were more than the accurate knowledge (objective knowledge) stored in consumers’ memory.
However, H1 was rejected as consumers’ OBK-ESA before communication (PRE-OBK-ESA) and SUK-ESA before communication (PRE-SUK-ESA) were not significantly different. Additionally, the proposed positive correlation between OBK-ESA and SUK-ESA (H3) was accepted for the ESA-W group but rejected for the ESA-H group. In the group of ESA-W, consumers’ OBK-ESA and SUK-ESA were correlated but in the group of ESA-H, consumers’ OBK-ESA and SUK-ESA were not correlated.

Limited research was found in the field of textile and apparel, investigating consumers’ knowledge of sustainable apparel. Thus, there was not a generally acknowledged conclusion on the relationship between consumers’ OBK-ESA and SUK-ESA. In a recent study investigating consumers’ OBK, SUK, and prior experience of organic cotton apparel, Han (2019) suggested that consumers’ OBK and SUK were independent. However, the knowledge assessment methods of Han (2019) were different from the assessment methods utilized in the present study, and the results regarding H1 and H3 in the current research varied from Han’s (2019) findings. Hence, the results of the present study were unique, and it was not possible to make similar studies in the field of ESA to support the findings in this study.

According to the theories and studies related to consumer knowledge, not solely focusing on textile and apparel, consumers’ OBK and SUK were not equal but correlated (Carlson et al., 2009; Raju et al., 1995). The findings regarding consumers’ knowledge of ESA in the present study do not entirely support this conclusion. Specifically, the acceptance of the difference between consumers’ OBK-ESA and SUK-ESA depends on whether the information of ESA is provided to and read by consumers. The theories and studies related to consumer knowledge were developed and conducted more than ten years ago. Thus, this may result in the inconsistency between the findings of this study and results of previous studies.
When the information was provided, there is significant difference between OBK-ESA and SUK-ESA. However, when there was no information provided, OBK-ESA and SUK-ESA were not significantly different. Additionally, the correlation between OBK-ESA and SUK-ESA existed in the ESA-W group but did not exist in the ESA-H group. In general, no overall conclusions were drawn regarding the relationship between OBK-ESA and SUK-ESA, as the relationship was influenced by whether the relevant information was provided and read, and selection of communication methods.

**The Theory of Planned Behavior (ESA)**

H5a and H5b were accepted as the positive relationships between consumers’ OBK-ESA and their attitudes toward the impact of purchasing ESA (ATT-ESA), and between SUK-ESA and ATT-ESA were found, respectively. Similarly, H7a and H7b, were accepted as the positive correlations between consumers’ OBK-ESA and their intentions to purchase ESA (INT-ESA), and between SUK-ESA and INT-ESA were identified, respectively. Thus, both OBK-ESA and SUK-ESA were predictors of consumers’ ATT-ESA and INT-ESA. In several previous studies, gaps between knowledge and actions (i.e., attitudes and intentions) were noted. These studies focused on ESA (Kim & Damhorst, 1998; Markkula & Moisander, 2012) and the general concept of sustainability, not only in the field of textile and apparel (Heiskanen, 2005; Valor, 2008).

However, except for the literature listed above, in most of the previous research exploring the relationship between consumers’ knowledge of ESA and their purchasing behavior regarding ESA products (e.g., Brosdahl & Carpenter, 2010; Kang et al., 2013; Kozar & Connell, 2013; Reiter & Kozar, 2016; Tevel, 2013), the positive relationships between consumers’ knowledge of ESA and ATT-ESA, and between knowledge and INT-ESA were supported. The findings
regarding H5a, H5b, H7a, and H7b in the present study support the literature. Additionally, the results regarding H9 supported the posited positive association between consumers’ ESA-ATT and ESA-INT. The results are consistent with the well-explored theory, the theory of planned behavior (Ajzen, 1991), and many empirical studies focusing on consumers’ behavior related to ESA (e.g., Kang et al., 2013; Maloney et al., 2014).

Generally, in the present study, consumers that were more knowledgeable about ESA and had more positive attitudes toward the impact of purchasing ESA, would have a greater intention to purchase ESA. The evidence in the current study confirms the validity of the relationship in the theory of planned behavior, and the feasibility of involving the factor, knowledge, as a direct predictor of consumers’ ATT-ESA and an indirect predictor of consumers’ INT-ESA.

Effects of Communication (ESA)

According to the analysis of the tested hypotheses, H11b, H15, and H19, using hangtags to communicate with consumers on ESA increased consumers’ SUK-ESA, made consumers’ ATT-ESA more positive, and increased consumers’ INT-ESA, respectively. However, it was also found that communication via hangtags did not influence consumers’ OBK-ESA (H11a). Similarly, the testing results of H13b and H16 indicate that after reading the information about ESA on product webpages, consumers’ SUK-ESA increased, and their ATT-ESA were more positive. In contrast, the information on product webpages did not impact consumers’ OBK-ESA (H13a) and INT-ESA (H20).

Many studies exploring consumers’ behavior regarding ESA posited that providing consumers with explicit information about ESA could raise awareness of ESA, and in turn, make consumers’ ATT-ESA more positive and increase their INT-ESA (Hustvedt & Bernard, 2008; Kang et al., 2013; Yan et al., 2012). Whereas there was limited research examining the actual
effects of communication on consumers’ OBK-ESA, SUK-ESA, ATT-ESA, and INT-ESA. It is noteworthy that the findings of this study do not support all of the assumed advantages of communication in the relevant literature. Information on hangtags did not effectively increase consumers’ OBK-ESA, and information on webpages neither effectively increased OBK-ESA nor resulting in INT-ESA being more positive.

Moreover, the testing results of H23a, H23b, H25, and H27 show that information regarding ESA provided via hangtags had more positive effects on consumers’ OBK-ESA than that provided via product webpages. In contrast, the effects of information on ESA hangtags were not significantly different from that on ESA product webpages on consumers’ SUK-ESA, ATT-ESA, and INT-ESA. Additionally, as discussed earlier, hangtags influenced consumers’ INT-ESA, but webpages did not. Hence, providing information via hangtags may be more effective than webpages in communicating with consumers regarding ESA.

**Socially Sustainable Apparel (SSA)**

*Objective Knowledge of SSA*. An instrument with eight items was developed to evaluate consumers’ objective knowledge of SSA (OBK-SSA). Six items were related to the issues of child labor, low wages, extra hours, unsafe conditions, exposure to hazardous materials (health), and animal cruelty in the T/A industry. The other two items were related to the adoption of codes of conduct and the use of certifications regarding socially sustainable practices in this industry. It was found that consumers’ knowledge about codes of conduct and animal cruelty was less than their knowledge of other topics in the instrument. Additionally, their knowledge of these two items did not increase after communication. Hence, brands and retailers should make more efforts to communicate with and educate consumers on this industry’s adoption of codes of
conduct. Also, they should improve their communication with consumers on the issues related to animal cruelty and more effectively introduce the efforts they have made to prevent animal cruelty.

**Objective and Subjective Knowledge of SSA.** As mentioned earlier in the discussion related to ESA, the theories and studies related to consumer knowledge suggested that consumers’ OBK and SUK were not equal but correlated (Carlson et al., 2009; Raju et al., 1995). The findings regarding consumers’ knowledge of SSA in the present study do not fully support the conclusions in the literature. Specifically, H2, which focused on the difference in consumers’ objective knowledge of (OBK-SSA) and subjective knowledge of SSA (SUK-SSA), was rejected. This means that consumers’ OBK-SSA and SUK-SSA were roughly equal. However, H4 was accepted as consumers’ OBK-SSA and SUK-SSA were positively correlated.

Limited research investigating consumers’ knowledge of sustainable apparel were found prior to the study. Additionally, studies related to consumers’ knowledge of sustainable apparel, focused more on the environmental dimension, and social sustainability was much less studied (Karaosman et al., 2017; Sudusinghe et al., 2018). Thus, in the literature there was a lack of knowledge about consumers’ knowledge of SSA. The results regarding consumers’ knowledge of SSA of this study were unique, and it was not possible to compare the findings in the present study with previous studies.

Furthermore, the findings regarding consumers’ knowledge of ESA and SSA in the present study indicate that the relationship between OBK-ESA and SUK-ESA and the relationship between OBK-SSA and SUK-SSA were different. Thus, consumers’ knowledge of ESA and SSA are two independent topics, and discussion of the two subjects should be conducted separately in future studies.
The Theory of Planned Behavior (SSA)

H6a and H8a were accepted as the relationship between consumers’ OBK-SSA and their attitudes toward the impact of purchasing SSA (ATT-SSA), and between consumers’ OBK-SSA and intentions to purchase SSA (INT-SSA) were confirmed, respectively. The findings align with the results in the study of Kozar and Connell (2013) exploring the relationships among consumers’ OBK-SSA, ATT-SSA, and INT-SSA.

Similarly, H6b and H8b were accepted as the relationship between consumers’ SUK-SSA and ATT-SSA, and between consumers’ SUK-SSA and INT-SSA were confirmed, respectively. This is consistent with the findings in the research of Dickson (2000) investigating consumers’ SUK, ATT, and INT toward SSA. Thus, both OBK-SSA and SUK-SSA are predictors of consumers’ ATT-SSA and INT-SSA. Moreover, the results regarding H10 affirmed the positive correlation between consumers’ SSA-ATT and SSA-INT. This finding provides supports for the well-explored theory, the theory of planned behavior (Ajzen, 1991), and the empirical studies investigating consumers’ behavior related to SSA (e.g., de Lenne & Vandenbosch, 2017; Dickson, 2000; Kozar & Connell, 2013).

Generally, in the present research, consumers that were more knowledgeable about SSA and had more positive attitudes toward the impact of purchasing SSA had greater intentions to purchase SSA. The evidence of the current study confirms the validity of the relationship among knowledge, attitudes, and intentions in the theory of planned behavior, and the feasibility of involving the factor, knowledge, as a direct predictor of consumers’ ATT-SSA and an indirect predictor of consumers’ INT-SSA.
**Effects of Communication (SSA)**

According to the analysis of the results related to H12b and H21, it was identified that the use of hangtags to communicate with consumers on SSA significantly increased consumers’ SUK-SSA and made INT-SSA more positive, respectively. However, the findings of H12a and H17 are consumers’ OBK-SSA did not significantly increase, and ATT-SSA did not significantly get more positive after reading the information on the hangtags. Furthermore, based on the test results of H14a, H14b, H18, and H22, it was found that after reading the information on SSA product webpages, consumers’ OBK-SSA, SUK-SSA, and INT-ESA did not significantly increase, and their ATT-SSA did not significantly get more positive.

Limited research focused on the impacts of delivering SSA messages via webpages, but some studies examined the effects of SSA hangtags on consumers’ purchasing behavior. However, the results in the relevant studies were not consistent. Hyllegard et al. (2012) found that SSA hangtags positively influenced consumers’ attitudes and intentions to socially sustainable businesses. In contrast, Dickson (2000) pointed out that there was only a small part of consumers whose purchases were influenced by SSA hangtags. These two studies were conducted eight years, and two decades ago, respectively. Currently, with the influence of social media and consumers’ raised awareness of sustainability, the effects of information regarding SSA provided via hangtags on consumers’ purchasing behavior might have changed. So, the findings of the present study conducted in 2020 support neither of the two studies argued above, as hangtags significantly improved consumers’ SUK-SSA and INT-SSA but did not significantly influence their OBK-SSA and ATT-SSA.

Moreover, the results of H24a, H24b, H26, and H28 indicate that the effects of SSA hangtags were not significantly different from that of webpages on consumers’ OBK-SSA, SUK-
SSA, ATT-SSA, and INT-SSA. However, hangtags may still be more effective than webpages in communicating with consumers regarding SSA, as hangtags significantly influenced consumers’ SUK-SSA and INT-SSA, but webpages did not.
CHAPTER 5

CONCLUSIONS

The purpose of this research is to investigate consumer knowledge of sustainable apparel and examine the effects of communication, referring to providing consumers with related information regarding sustainable apparel. Two objectives are identified to achieve the purpose. Objective one is to develop instruments to assess consumer knowledge of sustainable apparel. Objective two is to investigate the impacts of communication by examining direct outcomes (knowledge) and indirect outcomes (attitudes and intentions). This chapter starts with an overview of this dissertation research. Then, according to this study’s findings, the theoretical and managerial implications of this study are presented. At last, the limitations of the present study and suggestions for future research are explained.

Overview

The T/A industry, as a 2.4 trillion-dollar industry employing approximately 75 million people worldwide, is responsible for 8-10% of the world’s greenhouse gas emissions, 20% of industrial wastewater pollution worldwide, and the loss of 500-billion-dollar value every year due to clothing underutilization and lack of recycling (United Nations Alliance for Sustainable Fashion, 2020). With these issues increasingly recognized in the T/A industry, the concept of sustainability has attracted many companies to re-establish their supply chains and reduce their negative environmental and social impacts (Turker & Altuntas, 2014).

Additionally, as critical drivers of this industry, consumers have more demands than before for sustainable apparel products made under environmentally and socially sustainable practices throughout the supply chain (Hill & Lee, 2012; McNeill & Moore, 2015; The Business of Fashion & McKinsey Company, 2020). This industry’s sustainability implementation
processes involve everyone along the supply chain, from producers to final consumers (United Nations, 2015). Moreover, it is necessary to educate consumers on sustainable consumption and provide them with adequate information on sustainable apparel products (United Nations, 2015).

Researchers emphasized the importance of consumers’ knowledge of sustainable apparel and pointed out consumers’ lack of relevant knowledge (e.g., Kang et al., 2013; Kozar & Connell, 2015; Okur & Saricam, 2019). Additionally, they encouraged better communication between companies and consumers to improve consumers’ knowledge, attitudes, and intentions toward sustainable apparel. However, there is limited research investigating the impacts of communication. Hence, the main objective of this dissertation research is to examine the impacts of communication, including direct outcomes, objective knowledge (OBK) and subjective knowledge (SUK), and indirect outcomes, attitudes (ATT), and intentions (INT).

Considering the importance of consumers’ knowledge of sustainable apparel, and the lack of broadly accepted consumer knowledge assessment instruments in the relevant literature, another objective of the present study is to develop knowledge assessment instruments. Based on the instruments used to evaluate consumers’ knowledge of apparel produced under environmentally sustainable practices, known as environmentally sustainable apparel (ESA), and the apparel produced under socially sustainable practices, known as socially sustainable apparel (SSA), in the literature, and the issues and sustainable practices in the T/A industry, four instruments were established to measure consumers’ OBK-ESA, SUK-ESA, OBK-SSA, and SUK-SSA.

To investigate the effects of various communication methods, two methods, including an offline communication method, hangtags (H), and an online communication method, product webpages (W), were taken into consideration in this study. The information provided via
hangtags and webpages was similar and was generated based on the hangtags and webpages utilized by some well-known brands (e.g., Levi Strauss and VF Corporation). However, the information on webpages was more detailed, as there was more space. Additionally, three groups of hypotheses regarding the two communication methods were developed according to the theories and studies of consumer knowledge, planned behavior, and communication effects.

Data related to the hypotheses, including consumers’ demographics and their knowledge, attitudes, and intentions toward sustainable apparel before and after communication, were collected from online surveys. Gen Y consumers were more willing to purchase sustainable apparel than other consumers (Hill & Lee, 2012). Gen Z consumers’ concerns for sustainable apparel were proliferating (The Business of Fashion & McKinsey Company, 2020). Thus, the sample of the present research consisted of Gen Y and Gen Z adult consumers. There were four questionnaires, as there were two categories of sustainable apparel (ESA and SSA) and two types of communication (H and W). Participants were randomly assigned to one of the four formats, including ESA-H, ESA-W, SSA-H, SSA-W.

A total of 702 usable responses were collected from participants that were aged from 18 to 39 years old in 2020 and with at least a high school education degree residing in the United States. According to the hypothesis testing results, all of the hypotheses related to the theory of planned behavior (H5-H10) were accepted. However, only approximately half of the hypotheses regarding consumer knowledge (H1-H4) and one-third of the hypotheses about communication effects (H11-H28) were supported. In other words, the correlation between consumers’ OBK and SUK of sustainable apparel and the difference in these two variables was not entirely accepted. Additionally, communication did not always increase consumers’ OBK, SUK, ATT, and INT toward sustainable apparel.
Implications

The findings of this study provide theoretical and managerial implications. First, theoretical implications for academics are discussed based on the relevant theories and literature. Second, managerial implications for business operations are presented by describing the potential applications of the findings in the T/A market.

Theoretical Implications

This study provides several academic implications, as it generates empirical evidence for the theory of planned behavior and fills some research gaps identified based on previous studies. First, considering the problems within the reviewed instruments used to assess consumer knowledge of sustainable apparel in the literature, this study made improvements on the instruments by modifying and expanding them. Specifically, four knowledge assessment instruments were established in this study to evaluate consumers’ objective knowledge of environmentally sustainable apparel (OBK-ESA), subjective knowledge of ESA, objective knowledge of socially sustainable apparel (OBK-SSA) and subjective knowledge of SSA. Second, this study lends insights to researchers who are interested in consumer knowledge of ESA and SSA by investigating consumer knowledge based on the structure of knowledge. Most previous studies did not consider the structure of consumer knowledge that consisted of OBK and subjective knowledge (SUK) (Park & Lessig, 1981). Researchers measured OBK or SUK, and sometimes these two variables were mixed up. The present study compared consumers’ OBK and SUK and concluded according to the two sustainable apparel categories, including ESA and SSA. Further, it was found that the effects of communication on OBK and SUK were different. For example, the use of hangtags improved consumers’ SUK-
ESA but did not improve their OBK-ESA. Hence, it is necessary to consider consumer knowledge structure when assessing consumers’ knowledge of ESA and SSA.

Third, this study adds values to the existing theory, the theory of planned behavior, by applying it to Gen Y and Gen Z adult consumers’ knowledge, attitudes, and intentions toward ESA and SSA. As Ajzen (1991) stated, this theory is open to the inclusion of additional predictors that can capture the variance in consumer behavior. Some researchers regarded knowledge as an essential factor empowering sustainable consumption (e.g., Okur & Saricam, 2019). However, other researchers argued that there were gaps between knowledge and consumers’ purchasing behavior (e.g., Heiskanen, 2005; Valor, 2008). This study's findings proved the positive relationship between ATT and INT in the theory of planned behavior and the feasibility of involving the factor, knowledge, as a direct predictor of consumers’ ATT to sustainable apparel and an indirect predictor of consumers’ INT to purchase sustainable apparel.

Lastly, this study examines the effects of communication on consumers’ OBK, SUK, ATT, and INT toward sustainable apparel. Previous research found that consumers lacked knowledge of sustainable apparel, and researchers encouraged communication between companies and consumers to increase consumers’ awareness of sustainable apparel and promote sustainable consumption (e.g., Kozar & Connell, 2015; Yan et al., 2012). However, there is limited research examining the specific effects of communication in depth. This study evaluated and compared consumers’ OBK, SUK, ATT, and INT toward sustainable apparel before and after communication. Moreover, the effects of the two communication methods, including hangtags and webpages, were compared. Specifically, hangtags effectively increase the measurements of consumers’ SUK-ESA, SUK-SSA, ATT-ESA, INT-ESA, and INT-SSA, and webpages are effective in enhancing consumers’ SUK-ESA and ATT-ESA.
Managerial Implications

Along with the theoretical implications, this study also offers several practical implications. First, it was found that consumers lacked knowledge about the impact of solid waste disposal, acceptance of codes of conduct, and the issues related to animal cruelty in the T/A industry. Additionally, consumers’ knowledge regarding the items listed above did not increase after reading the provided information. Hence, brands and retailers should improve consumers’ awareness of these issues and practices with more effective communication methods.

Second, the hypothesis testing results about the theory of planned behavior confirmed that consumer knowledge positively influences consumers’ purchases of ESA and SSA products. Moreover, consumers still lack knowledge of sustainable apparel. Thus, companies need to seek approaches that can significantly improve consumer’s knowledge of ESA and SSA.

Third, even though previous studies assumed that communication could increase consumer knowledge, in turn, enhance consumers’ sustainable consumption. However, the results of hypotheses regarding communication effects suggested that communication cannot always impact OBK, SUK, ATT, and INT. The effects depend on product categories (ESA and SSA) and communication methods (hangtags and webpages). Additionally, although there is more detailed information on webpages, hangtags seem to be more effective than webpages in promoting consumers’ consumption of sustainable apparel. Hence, companies should carefully apply appropriate communication methods based on their product categories and retail strategies.
Limitations and Future Research

Despite the academic and managerial implications of this study presented above, this study also has certain limitations that require future studies to address. First, the knowledge assessment instruments are initially established and used for the first time in this study. The instruments include the items employed from previous studies, and the items developed based on the T/A industry’s critical issues and sustainable practices. The topic of sustainability is dynamic, and the knowledge assessment instruments should be modified according to topic trends. For example, if future studies are conducted in ten years, other critical issues may be associated with this industry. Therefore, these issues and practices should be taken into consideration when evaluating consumer knowledge.

Second, this study employed respondents aged 18 to 39 years old in 2020 (Gen Y and Gen Z adults), had at least a high school education level, and resided in the United States. Therefore, the findings of this study may not be applicable to the entire demographic of consumers. Future studies are advised to collect data from more age groups, education levels, and diverse regions to generalize sufficient results.

Third, the hangtags and webpages of the denim jeans product example were built by the authors of the present study. They were designed to provide respondents with relevant information corresponding to the items used to evaluate consumer knowledge. Even though denim jeans were regarded as an appropriate apparel product category to perform research about sustainable apparel (Jegethesan et al., 2012), they cannot represent all of the apparel categories. Thus, future research may include other apparel types, such as T-shirts, for more generalizable results.
Fourth, this study focused more on the direct communication outcomes, objective knowledge and subjective knowledge than the indirect outcomes, attitudes and intentions. A thorough review on the instruments used to assess consumer knowledge of sustainable apparel in the literature was conducted. As a result, four relevant instruments were initially developed for this dissertation. Future studies should refine the instruments assessing indirect outcomes.

Fifth, survey participants’ familiarity and awareness regarding the terminology used in the questionnaires were not assessed in this study. Also, their attention and concentration when reading the questions, hangtags, and webpages were not evaluated. This may cause bias and influence the results. Thus, future studies should address these issues.

Lastly, this study only involved two communication methods, hangtags and product webpages, to examine the effects of communication on consumer behavior and compare the impact of different communication methods. Hence, this study did not provide insights regarding the most effective communication method in the market. With the rapid development of social media, there is more variety in communication between companies and consumers. Therefore, future research should consider more communication methods to generalize more insights for academia and the industry.
REFERENCES


Elkington, J. (2013). Enter the triple bottom line. In The triple bottom line (pp. 23-38).


https://www.roadmaptozero.com/input#Gateway-Chemical-Module


APPENDICES
# Appendix A

## Certifications

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Logo</th>
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<tr>
<td>Better Cotton Initiative (Better Cotton Initiative, 2020)</td>
<td>A Member must be sourcing at least 5% of their cotton as Better Cotton to start using the mark, with a plan to be sourcing at least 50% of their cotton as Better Cotton within five years. When you see the BCI logo or ‘On-Product Mark’ on the packaging, it does not mean the product is made of physically traceable Better Cotton. It means that you’re buying a majority cotton product from a retailer or brand committed to sourcing Better Cotton and investing in BCI Farmers.</td>
<td><img src="image1" alt="BCI logo" /></td>
</tr>
<tr>
<td>Bluesign® (Bluesign, 2020)</td>
<td>The Bluesign system aims to find solutions for sustainable textile production by eliminating harmful substances at each step of the supply chain and approving chemicals, processes, materials, and products that are safe for the environment, the workers, and customers. Five principles: Resource Productivity, Consumer Safety, Water Emission, Air Emission, and Occupational Health &amp; Safety.</td>
<td><img src="image2" alt="Bluesign logo" /></td>
</tr>
<tr>
<td>Cradle to Cradle Certified (CM) Products Program (C2C Certified, 2020)</td>
<td>Cradle to Cradle Certification is a third-party sustainability label that requires achievement across multiple attributes: use materials that are safe for human health and the environment through all use phases; product and system design for material re-utilization, such as recycling or composting use of renewable energy, efficient use of water, and maximum water quality associated with the production company strategies for social responsibility. Cradle to Cradle certification is a four-tiered approach consisting of Basic, Silver, Gold, and Platinum. This certification program applies to materials, sub-assemblies, and finished products.</td>
<td><img src="image3" alt="Cradle to Cradle logo" /></td>
</tr>
<tr>
<td>Fair Trade Certified™ (Fair Trade Certified, 2020)</td>
<td>Each article of Fair Trade Certified™ clothing works to provide safe working conditions and sustainable livelihoods for factory workers worldwide. The additional money they earn with every sale is used to fund important projects that address major needs.</td>
<td><img src="image4" alt="Fair Trade Certified logo" /></td>
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Appendix A

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<tr>
<td><strong>Global Organic Textile Standard</strong></td>
<td>GOTS was developed to unify the various existing standards and draft standards in eco textile processing and provide a credible assurance to the end consumer. A textile product carrying the GOTS label grade ‘organic’ must contain a minimum of 95% certified organic fibers, whereas a product with the label grade ‘made with organic’ must have at least 70% certified organic fibers.</td>
<td></td>
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<td>(Global Organic Textile Standard, 2020)</td>
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<tr>
<td><strong>Global Recycled Standard</strong></td>
<td>The Global Recycled Standard is intended for use with any product that contains at least 20% Recycled Material. Each production stage must be certified, beginning at the recycling stage and ending at the last seller in the final business-to-business transaction. Material Collection and Material Concentration sites are subject to self-declaration, document collection, and on-site visits.</td>
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<tr>
<td>(Textile Exchange, 2017b)</td>
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<tr>
<td><strong>STANDARD 100 by OEKO-TEX®</strong></td>
<td>The precondition for the certification of products following STANDARD 100 by OEKO-TEX® is that all parts of an article meet the required criteria - in addition to the outer fabric, for example, also the sewing threads, inserts, prints, etc., as well as non-textile accessories, such as buttons, zip fasteners, rivets, etc.</td>
<td></td>
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<tr>
<td>(STANDARD 100 by OEKO-TEX®, 2020)</td>
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Appendix B

Questionnaire for Group 1 (Hangtags & Environmentally Sustainable Apparel)

Section a

Q1: What is your age group?
- Under 18 years old
- 18-23 years old
- 24-39 years old
- 40 years or older
- Prefer not to say

Q2: Please specify your ethnicity.
- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other
- Prefer not to say

Q3: What gender do you specify as?
- Male
- Female
- Other
- Prefer not to say

Q4: What is the highest degree or level of education you have completed?
- Some High School
- High School
- Some College
- Bachelor’s Degree
- Master’s Degree
- Ph.D. or higher
- Other
Section b

Scenario: You are looking for a pair of jeans to purchase. Here is the hangtag of a pair of environmentally sustainable jeans you find in store. Please read the information on this hangtag and then continue this survey.
Section c

Instruction for Q5-Q23: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q5-Q18

Q5: The production and processing of natural fibers such as cotton does not consume large quantities of water.
Q6: Adding color through dyeing and printing processes uses a lot of water.
Q7: There are water-saving and chemical-saving technologies in the textile and apparel industry.
Q8: The textile and apparel industry is one of the major polluting industries in the world.
Q9: Chemical pollutants are not produced during cultivation of natural fibers such as cotton.
Q10: Microfiber pollution is related to the textile and apparel industry.
Q11: The textile and apparel industry is a large contributor to greenhouse gas emission.
Q12: Natural fibers can decompose in landfills, so sending natural fibers into landfills will not be harmful to the environment.
Q13: With the help of company’s take-back programs, global annual textile and apparel waste is decreasing.
Q14: Consumers do not contribute to the environmental issues associated with the textile and apparel industry.
Q15: Better Cotton Initiative (BCI) cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.
Q16: Only the production of fast fashion products will cause environmental issues.
Q17: Some companies in the textile and apparel industry have made commitments to be more sustainable.
Q18: There are certifications in the textile and apparel industry to ensure a product is environmentally sustainable.

Q19-Q21

Q19: I am familiar with sustainable materials used in textile and apparel products.
Q20: I am familiar with the environmental issues in the textile and apparel industry.
Q21: I am familiar with how to extend the life of textile and apparel products.

Q22
Q22: I think purchasing this pair of jeans produced using environmentally sustainable practices is helpful in protecting the environment.

Q23
Q23: I will consider purchasing this pair of jeans produced using environmentally sustainable practices.
Section d

**Instruction:** Please read the information on all of the hangtags and then continue this survey.
FOAM DYEING

Foam dyeing entirely replaces the traditional water vats and chemical baths of conventional indigo dyeing, saving a large amount of water and chemical. It also reduces energy use and waste compared to the conventional denim dyeing process.

DENIM CARE GUIDE

Following these instructions is better for denim, AND for the environment, such as water and energy saving, and microfiber pollution reducing.

1. Wash Less to maintain fit.
2. Wash Cold to keep the color you love.
3. Line Dry to avoid shrinkage.

OUR GOALS

100% Circular & Climate Positive

A circular approach to how products are made and used. Use only recycled or other sustainably sourced materials. A climate positive value chain.

DON’T FORGET...

Drop off your denim or mail it in to us and earn a coupon for your next purchase.

Thanks for your efforts on keeping textile waste out of landfills!
Section e

Instruction for Q24-Q42: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q24-Q37
Q24: The production and processing of natural fibers such as cotton does not consume large quantities of water.
Q25: Adding color through dyeing and printing processes uses a lot of water.
Q26: There are water-saving and chemical-saving technologies in the textile and apparel industry.
Q27: The textile and apparel industry is one of the major polluting industries in the world.
Q28: Chemical pollutants are not produced during cultivation of natural fibers such as cotton.
Q29: Microfiber pollution is related to the textile and apparel industry.
Q30: The textile and apparel industry is a large contributor to greenhouse gas emission.
Q31: Natural fibers can decompose in landfills, so sending natural fibers into landfills will not be harmful to the environment.
Q32: With the help of company’s take-back programs, global annual textile and apparel waste is decreasing.
Q33: Consumers do not contribute to the environmental issues associated with the textile and apparel industry.
Q34: Better Cotton Initiative (BCI) cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.
Q35: Only the production of fast fashion products will cause environmental issues.
Q36: Some companies in the textile and apparel industry have made commitments to be more sustainable.
Q37: There are certifications in the textile and apparel industry to ensure a product is environmentally sustainable.

Q38-Q40
Q38: I am familiar with sustainable materials used in textile and apparel products.
Q39: I am familiar with the environmental issues in the textile and apparel industry.
Q40: I am familiar with how to extend the life of textile and apparel products.

Q41
Q41: I think purchasing this pair of jeans produced using environmentally sustainable practices is helpful in protecting the environment.

Q42
Q42: I will consider purchasing this pair of jeans produced using environmentally sustainable practices.
Appendix C

Questionnaire for Group 2 (Product Webpages & Environmentally Sustainable Apparel)

Section a

Q1: What is your age group?
- Under 18 years old
- 18-23 years old
- 24-39 years old
- 40 years or older
- Prefer not to say

Q2: Please specify your ethnicity.
- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other
- Prefer not to say

Q3: What gender do you specify as?
- Male
- Female
- Other
- Prefer not to say

Q4: What is the highest degree or level of education you have completed?
- Some High School
- High School
- Some College
- Bachelor’s Degree
- Master’s Degree
- Ph.D. or higher
- Other
Section b

Scenario: You are looking for a pair of jeans to purchase. Here is the webpage of a pair of environmentally sustainable jeans you find online. Please read the information on this webpage and then continue this survey.
Section c

Instruction for Q5-Q23: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q5-Q18

Q5: The production and processing of natural fibers such as cotton does not consume large quantities of water.
Q6: Adding color through dyeing and printing processes uses a lot of water.
Q7: There are water-saving and chemical-saving technologies in the textile and apparel industry.
Q8: The textile and apparel industry is one of the major polluting industries in the world.
Q9: Chemical pollutants are not produced during cultivation of natural fibers such as cotton.
Q10: Microfiber pollution is related to the textile and apparel industry.
Q11: The textile and apparel industry is a large contributor to greenhouse gas emission.
Q12: Natural fibers can decompose in landfills, so sending natural fibers into landfills will not be harmful to the environment.
Q13: With the help of company’s take-back programs, global annual textile and apparel waste is decreasing.
Q14: Consumers do not contribute to the environmental issues associated with the textile and apparel industry.
Q15: Better Cotton Initiative (BCI) cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.
Q16: Only the production of fast fashion products will cause environmental issues.
Q17: Some companies in the textile and apparel industry have made commitments to be more sustainable.
Q18: There are certifications in the textile and apparel industry to ensure a product is environmentally sustainable.

Q19-Q21
Q19: I am familiar with sustainable materials used in textile and apparel products.
Q20: I am familiar with the environmental issues in the textile and apparel industry.
Q21: I am familiar with how to extend the life of textile and apparel products.

Q22
Q22: I think purchasing this pair of jeans produced using environmentally sustainable practices is helpful in protecting the environment.

Q23
Q23: I will consider purchasing this pair of jeans produced using environmentally sustainable practices.
Section d

**Instruction:** Please read the information on all of the images (product webpages provided) and then continue this survey.
Materials

**Cotton** used in this collection is purchased from Better Cotton Initiative.

BCI exists to make cotton production better for the people who produce it, better for the environment it grows in, and better for the sector’s future.

We pledge 100% sustainable cotton (recycled cotton, organic cotton, BCI cotton) by 2025.

**Polyester** used here is REPREVE, a kind of recycled polyester fiber made from recycled plastic bottles.

We source REPREVE to reduce the environmental effects related to polyester, such as greenhouse gas emissions and energy consumption.

---

**Foam Dyeing**

Foam dyeing entirely replaces the traditional water vats and chemical baths of conventional indigo dyeing, saving a large amount of water and chemical.

Additional benefits of the foam dyeing technology include:

- Reduction in factory footprint
- Same or better dye quality
- Net reductions of energy usage (>90%)
DENIM CARE GUIDE

**Wash Less.** Wash once every 10 wears at most to maintain fit.

**Wash Cold.** Washing with cold water protects against fading and shrinking. Turn your jeans inside out and avoid harsher soaps to preserve that indigo shade.

**Line Dry.** Line-drying preserves the fit and helps avoid possible shrinkage or fabric warping.

Following these instructions will help denim fit better, look better and last longer. AND it’s better for the environment (i.e. save water, energy, and reduce microfiber pollution).

---

**BLUE JEANS GO GREEN**

To help keep clothing in our daily use and out of landfills, we're partnering with Cotton’s Blue Jeans Go Green™ program, an initiative focused on recycling denim.

Drop off your denim or mail it in to us and earn a coupon for next purchase.

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100% Circular & Climate Positive

A circular approach to how products are made and used.

Use only recycled or other sustainably sourced materials.

A climate positive value chain.

OUR GOAL
Section e

Instruction for Q24-Q42: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q24-Q37
Q24: The production and processing of natural fibers such as cotton does not consume large quantities of water.
Q25: Adding color through dyeing and printing processes uses a lot of water.
Q26: There are water-saving and chemical-saving technologies in the textile and apparel industry.
Q27: The textile and apparel industry is one of the major polluting industries in the world.
Q28: Chemical pollutants are not produced during cultivation of natural fibers such as cotton.
Q29: Microfiber pollution is related to the textile and apparel industry.
Q30: The textile and apparel industry is a large contributor to greenhouse gas emission.
Q31: Natural fibers can decompose in landfills, so sending natural fibers into landfills will not be harmful to the environment.
Q32: With the help of company’s take-back programs, global annual textile and apparel waste is decreasing.
Q33: Consumers do not contribute to the environmental issues associated with the textile and apparel industry.
Q34: Better Cotton Initiative (BCI) cotton, organic cotton, and recycled cotton are three kinds of sustainable cotton.
Q35: Only the production of fast fashion products will cause environmental issues.
Q36: Some companies in the textile and apparel industry have made commitments to be more sustainable.
Q37: There are certifications in the textile and apparel industry to ensure a product is environmentally sustainable.

Q38-Q40
Q38: I am familiar with sustainable materials used in textile and apparel products.
Q39: I am familiar with the environmental issues in the textile and apparel industry.
Q40: I am familiar with how to extend the life of textile and apparel products.

Q41
Q41: I think purchasing this pair of jeans produced using environmentally sustainable practices is helpful in protecting the environment.

Q42
Q42: I will consider purchasing this pair of jeans produced using environmentally sustainable practices.
Appendix D

Questionnaire for Group 3 (Hangtags & Socially Sustainable Apparel)

Section a

Q1: What is your age group?
- Under 18 years old
- 18-23 years old
- 24-39 years old
- 40 years or older
- Prefer not to say

Q2: Please specify your ethnicity.
- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other
- Prefer not to say

Q3: What gender do you specify as?
- Male
- Female
- Other
- Prefer not to say

Q4: What is the highest degree or level of education you have completed?
- Some High School
- High School
- Some College
- Bachelor’s Degree
- Master’s Degree
- Ph.D. or higher
- Other
Section b

Scenario: You are looking for a pair of jeans to purchase. Here is the hangtag of a pair of socially sustainable jeans you find in store. Please read the information on this hangtag and then continue this survey.
Section c

**Instruction for Q5-Q17:** Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

**Q5-Q12**
Q5: The use of child labor is a practice in the textile and apparel industry throughout the world.
Q6: Some employees in the textile and apparel industry are not paid a living wage.
Q7: Work extra hours is a common practice in the textile and apparel industry throughout the world.
Q8: Some employees in the textile and apparel industry work under unsafe working conditions.
Q9: Workers in the textile and apparel industry have the potential for exposure to dangerous chemicals.
Q10: Adoption of codes of conduct is mandatory in the textile and apparel industry.
Q11: Animal cruelty does not exist in the textile and apparel industry.
Q12: There are certifications in the textile and apparel industry to ensure a product is produced using socially sustainable practices.

**Q13-Q15**
Q13: I am familiar with the issues related to materials obtained from animals in textile and apparel products.
Q14: I am familiar with the issues related to workers in the textile and apparel industry.
Q15: I am familiar with the efforts made by the textile and apparel industry to encourage apparel produced using socially sustainable practices.

**Q16**
Q16: I think purchasing this pair of jeans produced using socially sustainable practices is helpful in protecting society and workers in the textile and apparel industry.

**Q17**
Q17: I will consider purchasing this pair of jeans produced using socially sustainable practices.
Section d

**Instruction:** Please read the information on all of the hangtags and then continue this survey.
Ideal Plant Model

We manage all of our owned facilities according to an IPM system, a leading set of expectations designed to provide safe, clean working environments.

Global Compliance Program

Our Ethics and Compliance Program helps ensure our associates have the guidance and resources needed to operate with the highest standards of corporate conduct in all our business dealings globally.

Vegan Leather

All patches used in this collection are made from vegan leather.

Cows are subject to extreme crowding and castration and tail-docking without pain relief, before being killed and skinned for the material. To avoid animal cruelty, we use vegan leather in this collection.
Section e

**Instruction for Q18-Q30:** Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

**Q18-Q25**

Q18: Use of child labor is a practice in the textile and apparel industry throughout the world.
Q19: Some employees in the textile and apparel industry are not paid minimum living wage.
Q20: Work extra hours is a common practice in the textile and apparel industry throughout the world.
Q21: Some employees in the textile and apparel industry work under unsafe working conditions.
Q22: Workers in the textile and apparel industry have the potential for exposure to dangerous chemicals.
Q23: Adoption of codes of conduct is mandatory in the textile and apparel industry.
Q24: Animal cruelty does not exist in the textile and apparel industry.
Q25: There are certifications in the textile and apparel industry to ensure a product is produced using socially sustainable practices.

**Q26-Q28**

Q26: I am familiar with the issues related to materials obtained from animals in textile and apparel products.
Q27: I am familiar with the issues related to workers in the textile and apparel industry.
Q28: I am familiar with the efforts made by the textile and apparel industry to encourage apparel produced using socially sustainable practices.

**Q29**

Q29: I think purchasing this pair of jeans produced using socially sustainable practices is helpful in protecting society and workers in the textile and apparel industry.

**Q30**

Q30: I will consider purchasing this pair of jeans produced using socially sustainable practices.
Appendix E

Questionnaire for Group 4 (Product Webpages & Socially Sustainable Apparel)

Section a

Q1: What is your age group?
• Under 18 years old
• 18-23 years old
• 24-39 years old
• 40 years or older
• Prefer not to say

Q2: Please specify your ethnicity.
• White
• Hispanic or Latino
• Black or African American
• Native American or American Indian
• Asian / Pacific Islander
• Other
• Prefer not to say

Q3: What gender do you specify as?
• Male
• Female
• Other
• Prefer not to say

Q4: What is the highest degree or level of education you have completed?"
• Some High School
• High School
• Some College
• Bachelor’s Degree
• Master’s Degree
• Ph.D. or higher
• Other
Section b

Scenario: You are looking for a pair of jeans to purchase. Here is the webpage of a pair of socially sustainable jeans you find online. Please read the information on this webpage and then continue this survey.

**JEANS**  
A Collection for Sustainability

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**Size Guide**

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</table>

1  

ADD TO BAG

FIND IN STORE

SHARE 🌐
Section c

Instruction for Q5-Q17: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q5-Q12
Q5: The use of child labor is a practice in the textile and apparel industry throughout the world.
Q6: Some employees in the textile and apparel industry are not paid a living wage.
Q7: Work extra hours is a common practice in the textile and apparel industry throughout the world.
Q8: Some employees in the textile and apparel industry work under unsafe working conditions.
Q9: Workers in the textile and apparel industry have the potential for exposure to dangerous chemicals.
Q10: Adoption of codes of conduct is mandatory in the textile and apparel industry.
Q11: Animal cruelty does not exist in the textile and apparel industry.
Q12: There are certifications in the textile and apparel industry to ensure a product is produced using socially sustainable practices.

Q13-Q15
Q13: I am familiar with the issues related to materials obtained from animals in textile and apparel products.
Q14: I am familiar with the issues related to workers in the textile and apparel industry.
Q15: I am familiar with the efforts made by the textile and apparel industry to encourage apparel produced using socially sustainable practices.

Q16
Q16: I think purchasing this pair of jeans produced using socially sustainable practices is helpful in protecting society and workers in the textile and apparel industry.

Q17
Q17: I will consider purchasing this pair of jeans produced using socially sustainable practices.
Section d

Instruction: Please read the information on all of the images (product webpages provided) and then continue this survey.
Fair Trade

All styles of this collection are Fair Trade Certified™ sewn.

Every purchase sends more money back to factory workers who earn premiums that can be allocated as cash, used for a collective social investment or both.

Fair trade is a global movement made up of a diverse network of producers, companies, shoppers, advocates, and organizations putting people and planet first.

A choice for Fair Trade Certified™ goods is a choice to support responsible companies, empower farmers, workers, and fishermen, and protect the environment.

Vegan Leather

Cows are subject to extreme crowding and castration and tail-docking without pain relief, before being killed and skinned for the material. To avoid animal cruelty, we use vegan leather in this collection.

Vegan leather is any material that resembles the aesthetics of animal leather, without using any animal products at all. There is now a variety of innovative plant-based leathers being produced that reduce consumption by utilizing waste organic matter, like leaves and fruit peels.
Global Compliance Program

Our Ethics and Compliance Program helps ensure our associates have the guidance and resources needed to operate with the highest standards of corporate conduct in all our business dealings globally.

The Five Key Principles of Our Code

1. We will lead with integrity
2. We will treat everyone with dignity and respect
3. We will compete fairly and honestly
4. We will follow the law everywhere we do business
5. We will strive to make our communities better

IDEAL PLANT MODEL

Introduced in 1993, the IPM enables us to enforce health and safety criteria that exceed local laws and requirements.

We apply U.S. Occupational Safety and Health Administration (OSHA) standards and the National Fire Protection Association (NFPA) Life Safety Code® in each facility, including locations where such standards are lower or nonexistent.
Section e

Instruction for Q18-Q30: Please read through the following statements and decide how much you either agree or disagree with each. The choices range from “Strongly Disagree” to “Strongly Agree.”

Q18-Q25
Q18: Use of child labor is a practice in the textile and apparel industry throughout the world.  
Q19: Some employees in the textile and apparel industry are not paid minimum living wage.  
Q20: Work extra hours is a common practice in the textile and apparel industry throughout the world.  
Q21: Some employees in the textile and apparel industry work under unsafe working conditions.  
Q22: Workers in the textile and apparel industry have the potential for exposure to dangerous chemicals.  
Q23: Adoption of codes of conduct is mandatory in the textile and apparel industry.  
Q24: Animal cruelty does not exist in the textile and apparel industry.  
Q25: There are certifications in the textile and apparel industry to ensure a product is produced using socially sustainable practices.

Q26-Q28
Q26: I am familiar with the issues related to materials obtained from animals in textile and apparel products.  
Q27: I am familiar with the issues related to workers in the textile and apparel industry.  
Q28: I am familiar with the efforts made by the textile and apparel industry to encourage apparel produced using socially sustainable practices.

Q29
Q29: I think purchasing this pair of jeans produced using socially sustainable practices is helpful in protecting society and workers in the textile and apparel industry.

Q30
Q30: I will consider purchasing this pair of jeans produced using socially sustainable practices.
Appendix F

*Demographics of Valid Responses*

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