IQBAL, MD ARIF. Ph.D. Sustainable Technology Readiness of Apparel Professionals in Bangladesh. (2023)
Directed by Dr. Jin Su. 234 pp.

Because of the increased awareness of sustainability and its impact on a company's performance and competitiveness, sustainability-related technology adoption has become an important topic in modern technology and business literature. The global apparel industry is one of the focal industries that consider sustainability a core element to protect the environment and ensure a better work environment for employees. Sustainable technologies can provide excellent opportunities for apparel firms to foster their operational performance and, at the same time, assist the firms in addressing sustainability requirements, especially in developing countries. It is imperative to investigate individual managers' readiness toward sustainable technology. Previous studies paid little attention to the factors influencing apparel managers' adoption of sustainable technology. Furthermore, existing literature has not addressed the factors impacting apparel managers' sustainable technology readiness. Given the research gaps, this dissertation has three specific objectives: (1) to investigate the relationships between apparel managers' knowledge and involvement in technology and their readiness toward sustainable technology; (2) to examine the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness; and (3) to investigate how apparel managers' sustainable technology readiness, their perceptions of social influences, facilitating conditions, and relative advantage of sustainable technology impact their intention to adopt sustainable technology.

To address the objectives, a conceptual model was developed based on a comprehensive literature review. The conceptual model is grounded on an integrated theoretical framework combining the unified theory of acceptance and use of technology (UTAUT), the diffusion of

innovation theory (DOI), and the technology readiness index (TRI). A Qualtrics-designed online survey was used to collect data from Bangladeshi apparel managers to test the hypothesized relationships among latent constructs in the model. A total of 4315 surveys were distributed. 376 responses were received (8.71% response rate), and 221 valid responses were utilized for statistical analysis. The hypothesized relationships were tested using a two-step structural equation modeling. The measurement model was first evaluated using confirmatory factor analysis, and then the structural model was assessed to test the hypothesized relationships. The results of the hypotheses testing indicated significant relationships between apparel technology knowledge and sustainable technology readiness, between knowledge about the environmental impact of apparel production and sustainable technology readiness, and between social influences and adoption intention. The results did not support the hypothesized relationships between sustainable technology readiness and adoption intention or between facilitating conditions and adoption intention. The hypothesized relationship between personal involvement and sustainable technology readiness was not supported either. The moderating roles of education and experience were found insignificant in the relationships between knowledge and involvement and sustainable technology readiness.

The dissertation provides several important contributions. First, the study focuses on sustainable technology readiness and adoption intention by apparel professionals, which previous researchers have not addressed. Second, this dissertation expands our understanding of the causal flow among cognitive variables of apparel managers, including their knowledge, personal involvement, technology readiness, and adoption intention toward sustainable technology. The study provides empirical evidence on the role of apparel professionals' characteristics (e.g., knowledge and involvement) in their sustainable technology readiness. Third, the findings of this study provide valuable guidance for the government and other policymakers in increasing the use of sustainable technologies in the apparel industry. Utilizing the findings of this study, the government may develop strategies to support and train apparel managers to adopt sustainability-related technologies. The apparel industry is the primary industry in Bangladesh. When the majority of apparel firms in Bangladesh start adopting sustainable technologies, it will be easier for Bangladesh to meet the Sustainable Development Goals (SDG), especially goal number 12 (Responsible Consumption and Production) and 13 (Climate Action).

SUSTAINABLE TECHNOLOGY READINESS

OF APPAREL PROFESSIONALS

IN BANGLADESH

by

Md Arif Iqbal

A Dissertation
Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro

2023

Approved by

Dr. Jin Su
Committee Chair

DEDICATION

To all the freedom fighters of Bangladesh who fought for the independence of Bangladesh in 1971. To all the workers of the textile and apparel industry in Bangladesh who brought the economic independence of Bangladesh.

To my father Wares Md Iqbal, my mother Mst. Safikunnesa, my wife Mahmuda Parvin Tanni, my elder son Wafif Iqbal, and my younger son who is yet to see the light of this earth.

APPROVAL PAGE

This dissertation written by Md Arif Iqbal has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair ____________________________
Dr. Jin Su

Committee Members ____________________________
Dr. Nancy Nelson Hodges

____
Dr. Vidyaranya Gargeya

____
Dr. Kittichai (Tu) Watchravesringkan

June 12, 2023
Date of Acceptance by Committee

June 12, 2023
Date of Final Oral Examination

ACKNOWLEDGEMENTS

I want to outspread my utmost gratitude and greatest appreciation to my dissertation supervisor Dr. Jin Su. I am profoundly thankful for her incredible support and irreplaceable guidance in this dissertation writing. I would like to thank Dr. Su for her patience and faith in me. I always receive inspiration from her humble approach to research in our field. Dr. Su is the greatest mentor I have ever seen. I genuinely appreciate the way she treats her students. I cannot imagine having a better mentor for my doctoral journey. I wish to continue this relationship in the future.

I want to express my gratefulness to Dr. Nancy Nelson Hodges for her support and guidance in my doctoral dissertation. Her research expertise and immense knowledge of the topic helped me during my doctoral journey. I have received immense support from Dr. Hodges throughout my Ph.D. life. She has provided me with the best possible assistantship, fellowship, teaching, and research opportunities in the last four years. I greatly appreciate all her help and support.

I sincerely appreciate the encouraging and valuable comments and suggestions from my dissertation committee members Dr. Vidyaranya Gargeya and Dr. Kittichai (Tu) Watchravesringkan. Dr. Gargeya has been very helpful and inspiring for my dissertation completion. He is my academic grandfather and was one of my supervisor's advisors. His philosophical sagacity stipulated unique insights in my dissertation. Dr. Tu’s is a person who was always supportive of me. His expertise in quantitative research and valuable suggestions impressively helped me in the dissertation research.

I also want to sincerely appreciate all the faculty members and staff of the CARS department. I would like to thank Dr. Elena Karpova for her valuable suggestions and guidance during coursework and job search. Ms. Rebecca Fallon, the office manager of the CARS department, was considerate and supportive of me. I greatly appreciate her help and kindness. Dr. Kemerly, Professor Wood, Dr. Bang, and Professor Carrico, thank you for your help during my time in the CARS department. My thankfulness goes to the Bryan School of Business and Economics and the University of North Carolina Greensboro for making my fully funded doctoral journey possible. I am a super proud Spartan and will always be. I want to thank my friends and peers in the department, including Farimah, Jeff, Sukyung, Meghan, Rachel, Annie, Farhan, Kavita, Hasan, Uma, Carol, Mon Thu, Narmin, Sherita, Kaylah, and Charlotte. We had some unforgettable memories here.

I want to extend my gratitude and highest appreciation to my cousin Md Tariqul Islam. He has played the role of my elder brother, mentor, teacher, and supporting hand throughout my life. He made me believe that hard work is the only key to achieving anything.

I want to thank my father, Wares Md Iqbal, and my mother, Mst. Safikunnesa for their continuous inspiration and for keeping faith in me. My wife, Mahmuda Parvin Tanni, was so supportive during my entire Ph.D. life. Without her kind support, it was not possible for me to finish this dissertation. My elder son Wafif Iqbal also was so considerate. He understood the importance of my studies and was excited at the same time about my Ph.D. I also want to thank my brother Asif and Taif for always inspiring me and taking care of our parents in my absence.

I want to show gratitude to my uncle Dr. Abdullah Al Mamun, who was the first Ph.D. in my family and inspired me to pursue my Ph.D. from a US university.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: INTRODUCTION

This chapter serves as an introduction to the dissertation proposal and consists of the following sections: (1) Statement of the Research Problem; (2) Background; (3) Research Gaps; (4) Purpose and Objectives; (5) Proposed Research Design; (6) Scope and Significance; (7) Definition of Key Terms; and (8) Outline of the Dissertation Proposal.

Statement of the Research Problem

What is the most significant risk for us as humans in the future? Failure in climate change adaptation and mitigation might be the most relevant answer to the question. Worldwide, governments, firms, and professionals are stimulating sustainable economic development, and the regulations are urging firms to reduce their energy consumption and waste. Sustainable technologies can be integrated into products and manufacturing operations (Schiederig et al., 2012), effectively accomplishing sustainable development. Sustainable technology can minimize the negative consequences on the environment by preventing or minimizing pollution and minimizing the consumption of energy and raw materials (Babl et al., 2014; Belis-Bergouignan et al., 2004; Fu et al., 2018; Luken & Van Rompaey, 2008; Shrivastava, 1995). These types of technologies not only play a critical role for countries in the transition to sustainable development but also simultaneously deliver firms with competitiveness and legitimacy (Bansal & Roth, 2000).

The global apparel industry has become a focal industry that considers sustainability a core element of protecting the environment. The textile and apparel industry is regarded as one of the most polluting industries globally (Shen et al., 2017). The manufacturing process of apparel products involves immense waste disposal to the environment and excessive use of natural resources (Niinimaki et al., 2020). On the one hand, apparel manufacturing consumes a massive amount of natural resources throughout its lifecycle; on the other hand, this industry emits a substantial amount of greenhouse gases (Niinimaki et al., 2020) and produces millions of tons of waste (Connell & Kozar, 2017; M. M. Islam et al., 2021). Therefore, this industry significantly impacts the environment through water and air pollution (Shen et al., 2017).

Many countries, along with some large global brands, initiated and imposed policies, guidelines, and regulations for conserving energy and natural resources and lessening the emissions of greenhouse gases. United Nations Climate Change established the "Fashion Industry Charter for Climate Action (FICCA)" that aspires to accomplish zero discharges from this industry by the year 2050 (Hoque et al., 2021; UNFCCC, 2021). International apparel brands like VF, H&M, Louis Vuitton, and Patagonia have propelled several sustainable initiatives along their supply chains to conform to legal and environmental regulations (O. Rahman & Gong, 2016; Shen et al., 2017). Bangladesh has become the second-largest apparel exporter in the world and one of the signatories of the FICCA (Hoque et al., 2021; UNFCCC, 2021). Being a signatory of FICCA and supplying apparel products to western brands, the Bangladeshi apparel industry needs to adopt sustainable practices (Koksal et al., 2017; Rahman & Gong, 2016) and technologies (Hoque et al., 2022; Iqbal & Su, 2021) that are helpful to achieve sustainability-related goals (Iqbal & Su, 2022).

It is to admit that the apparel industry is one of the major industries in the world responsible for creating adverse impacts on the environment, economy, and society. Apparel manufacturers share a dual responsibility (Yang et al., 2018). On one side, all the manufacturers expect a substantial return on their investment. On the other side, they are to address sustainability issues to minimize the negative impacts on the economy, society, and environment. The dual responsibility involves a situation where technology can play a significant role.

Technology can facilitate the growth and development of firms (Fu et al., 2018; Islam et al., 2021). Adopting information and manufacturing technologies can provide excellent opportunities for firms to foster their operational performance and, at the same time, assist the firms in addressing sustainability requirements, especially in developing countries (Bag et al., 2021; Islam et al., 2021).

With sustainability being a central issue for the global apparel industry, the social, environmental, and economic impacts of apparel manufacturing in developing countries (like Bangladesh) have become a greater concern for apparel retailers and consumers. Particularly after the incidents of Rana Plaza (April 24th, 2013) and Tazreen fashion (November 24th, 2012), sustainability compliance of Bangladeshi apparel firms has evolved into an important issue in the global apparel supply chain (Khurana & Ricchetti, 2016). Over the past decade, Bangladesh's apparel industry has upgraded its apparel product offerings by adopting various technologies in apparel manufacturing (Park-Poaps et al., 2020) and made impressive progress in addressing the sustainability-related goals demanded by retailers and consumers (Su et al., 2023). As the apparel export earnings of Bangladesh have been continuously increasing, it is important to note that after these two massive incidents, Bangladeshi apparel firms did not lose their competitiveness; instead, they have restored their attractiveness in the global apparel sourcing market.

The existing literature suggests that adopting technology can be one of the most efficient ways to address sustainability (Fu et al., 2018; Gupta et al., 2021); thus, this dissertation intends to investigate sustainable technology adoption by firm managers in Bangladesh's apparel industry. This dissertation will specifically investigate whether apparel managers are technologically ready (Moore & Benbasat, 1991; Parasuraman, 2000) for adopting sustainable technologies and how their technology readiness (Moore & Benbasat, 1991; Parasuraman, 2000) and other factors impact their intention to adopt sustainable technology. As managers of apparel firms are the decision-makers regarding technology use, it is crucial to understand their knowledge and involvement with technology, their knowledge about the environmental impact of apparel production, and how their involvement and knowledge impact their sustainable technology readiness. Examining apparel managers' knowledge and involvement is essential to understanding their personal propensity and adoption intention toward sustainability-related technology. Their readiness for sustainable technology will influence the decision-making process for their firms. This study is conducted in the context of individual managers working in the Bangladeshi apparel industry.

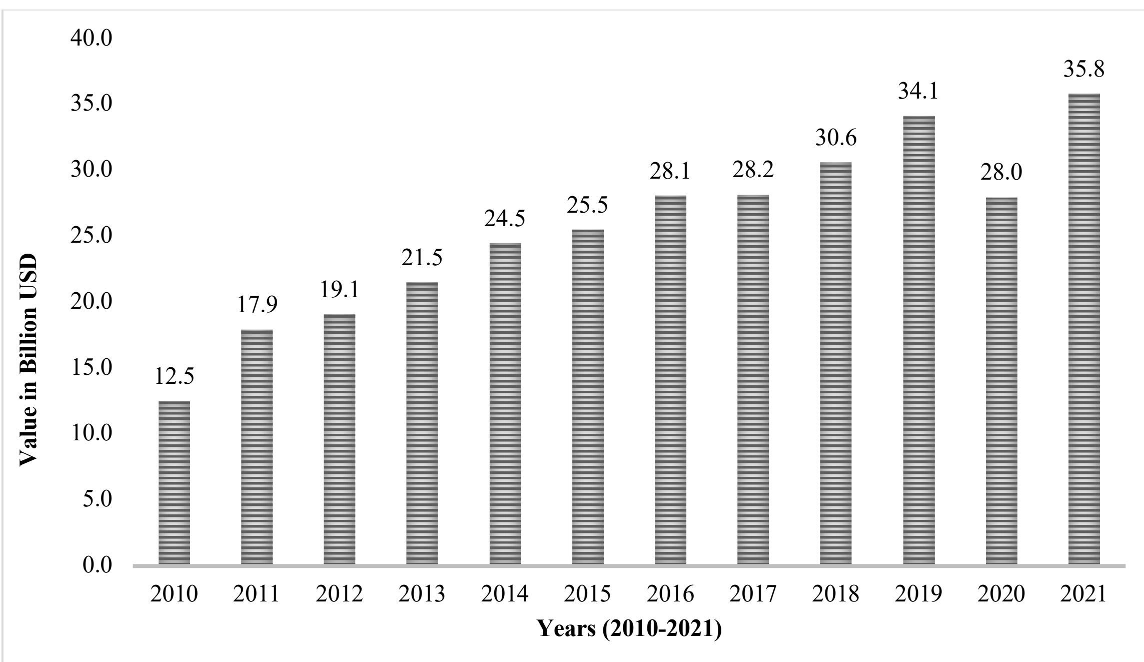
Background

An Overview of the Bangladeshi Apparel Industry

Bangladesh was promoted as a developing country in 2018 because of its incredible economic progress during the last twenty years (The World Bank, 2022). The country has effectively utilized the opportunity to capitalize on cheap labor in building a multi-billion-dollar apparel industry (R. M. Islam & Adnan, 2016). This industry helped Bangladesh to overcome intense poverty and to gain an industry-dependent economy (Iqbal et al., 2022). During the Multi-Fiber Agreement (MFA) period, which was phased out in 2005, Bangladesh was one of the countries that enjoyed a favorable export quota from developed countries, including the United States (Islam, 2021). After the phaseout of MFA, economists and industry professionals predicted that the apparel industry of Bangladesh would not last long. But, breaking all those predictions, the Bangladeshi apparel industry started serving as an apparel manufacturing hub in south-east Asia and became a trusted sourcing destination for almost all global brands due to its capacity, quality, and low cost in apparel manufacturing (Islam, 2021).

Being one of the fastest-growing developing countries, Bangladesh has become the second-largest exporter of apparel products in the global apparel market (WTO, 2022). Bangladesh earned more than $34 billion from apparel export in 2019 (Figure 1), contributing more than 80% of its total export income (Export Promotion Bureau, 2021). Even in the COVID-19 pandemic situation, the apparel industry of Bangladesh did not lose its export income significantly. The fiscal year of Bangladesh is counted as July to June instead of January to December. In the fiscal year 2021-2022 (July 2021 to June 2022), Bangladesh made $42.61 billion (BGMEA, 2022) from apparel export, which indicates a substantial rise in apparel export after COVID.

Figure 1. Apparel Export Value of Bangladesh in Billion U.S. Dollars



Note. Data was collected from BGMEA (2022) and the Export Promotion Bureau of Bangladesh (2022)

The amount of apparel products Bangladesh exports each year contributes 6.4% market share of the global apparel market (WTO, 2022). Thus, Bangladesh has become a sourcing hub of apparel products for retailers in the United States, EU countries, and other developed countries. In Bangladesh, all apparel firms are privately owned. According to BGMEA (Bangladesh Garment Manufacturers' and Exporters' Association), there are around 4500 export-oriented apparel firms. Around 40% of the firms are knitwear and sweater manufacturers, and the rest of the 60% are woven apparel manufacturers (BGMEA, 2022).

Technology Adoption and Sustainability in the Apparel Industry

A manufacturing firm's competitive advantage (Teece & Pisano, 2003) is dependent on various factors, where the technological capability of the managers is one of the most substantial factors (Lall, 1992). Innovation and technology are the two strategic driving forces for achieving and maintaining a firm's competitive advantage (Schumpeter, 1934; Solow, 1956). The relationship between the competitiveness of apparel firms and related environmental concerns was not considered important by the firms nearly three decades ago. But, after the establishment of environmental, economic, and social sustainability concepts, managers of the apparel firms have been accepting and implementing the protocols and regulations and practicing the manufacturing operations for better managing the supply chain to achieve the three aspects of sustainability. When firm managers are asked to abide by the regulations regarding sustainability, they can adopt sustainability-related technologies to significantly transform their manufacturing activities (Díaz-Chao et al., 2021). Previous literature argues that the interaction between sustainability and technology adoption reinforces a firm's ability to meet environmental, economic, and social sustainability-related goals and influences the firm to achieve a win-win situation (Adams et al., 2016; Porter & van der Linde, 1995). Particularly, it is evident from the literature that the adoption of technologies in order to increase a firm's efficiency might also enable the firms to better manage their sustainability efforts. The managers would gain a synergy effect to improve their operational and environmental performance (Ghisetti & Rennings, 2014; Ozusaglam et al., 2018).

Sustainability-related technology adoption has turned out to be an important topic in contemporary technology and business literature because of the enhanced awareness of sustainability and its impact on a firm's competitiveness and performance (Cheng et al., 2014). The global apparel industry is one of the focal industries that consider sustainability a core element to protect the environment and ensure a better work environment for workers. Technologies, such as computer-aided design, high-speed sewing machines, technology for dyeing and finishing apparel products with a reduced amount of energy, water, and chemicals, automation, information technology (IT) used in the sustainable production process, etc., have been adopted in the apparel industry to improve the environment, the well-being of employees, and the economic performance of firms. The study by Papahristou and Bilalis (2017) demonstrates how the use of technology can help firm managers minimize the use of resources and reduce the generation of waste in apparel manufacturing. The environmentally sound and socially responsible technologies play a substantial role in upgrading the global apparel industry and addressing the "triple bottom line" of people, planet, and profit (Connell & Kozar, 2017).

Research Gaps

Despite being a significant contributor to the global apparel industry, the Bangladeshi apparel industry has been less attracted by researchers. Research studies regarding sustainability-oriented technology adoption are very infrequent in the context of the Bangladeshi apparel industry. To the best of my knowledge, in the existing literature on general technology adoption-related research, only one study conducted by Park-Poaps et al. (2020) focused on technology adoption in Bangladesh's apparel industry. Following the modified framework of Wiarda (1987), Park-Poaps et al. (2020) replicated the study of Varukolu and Park-Poaps (2009) in Bangladesh to investigate the technology adoption status among Bangladeshi apparel firms. Their study examined the influences of contextual factors on the technology adoption level of clothing manufacturing firms. They found that information technology and related software were the most common technologies adopted, and automation-related technologies were the least common. Their findings suggested that export orientation negatively impacts technology adoption, while technical skill and competitive pressure positively impact the level of technology adoption. It should be highlighted that apart from the general technology adoption, the adoption of technologies that help apparel firms to achieve sustainability-related goals is particularly critical for the Bangladeshi apparel industry to maintain its competitiveness in the global apparel market and long-term backbone status in the country. However, whether the general technology adoption factors impact the adoption of sustainability-oriented technologies is yet to be addressed. Within this context, how ready the apparel firm managers of Bangladesh are and how they adopt technologies to address sustainability requirements are still unknown.

The only study that focused on sustainable technology adoption in the Bangladeshi apparel industry was conducted by Hoque et al. (2022). Their study examined the factors of sustainable technology adoption in the Bangladeshi apparel industry and the impact of sustainable technology adoption on the environmental and other performances of the firm. Their study adopted stakeholder theory and inspected the role of different stakeholders in facilitating sustainable technology adoption and improving firm performances and competitive advantages (Hoque et al., 2022). Previous studies in the existing literature investigated the impact of technology adoption by textile and apparel firms on firm performance (Andersen & Segars, 2001; Jin, 2006; Moore & Fairhurst, 2003; Su & Gargeya, 2012; Wadho & Chaudhry, 2018); however, the existing literature lacks evidence on how individual managers of an apparel firm perceive sustainable technology adoption. The abovementioned study by Hoque et al. (2022) focused on sustainable technology adoption at the firm level. So, prior studies have not addressed the perceptions of individual industry practitioners regarding sustainable technology adoption in the Bangladeshi apparel industry.

Technology readiness can be termed as people's propensity to embrace and use new technologies to accomplish goals in work life and at home. According to Parasuraman (2000), the different valence of feelings might co-exist in an individual's mind, and as a result, either positive or negative feelings towards technology will dominate each person. Parasuraman (2000) propositioned four dimensions of technology readiness: optimism, innovativeness, discomfort, and insecurity. The study of Parasuraman (2000) also recommended that optimism and innovativeness can be considered motivators of technology, whereas discomfort and insecurity are considered inhibitors. An individual's technology readiness can be measured by a combination of the inhibitors inhibiting the individual from adopting technology and the motivators fostering the individual to adopt the technology. The dimensions of technology readiness denote the overall attitudes of an individual toward new technologies rather than their competencies to use those technologies (Stanford et al., 2009). The central agreement of technology readiness research happens to be individual-specific rather than system or organization-specific (Celik & Kocaman, 2017).

Existing literature shows that technology readiness has been investigated widely for different technologies in different industries. The most common contexts where technology readiness has been investigated are the construction industry (Jaafar et al., 2007; Kuo, 2013), the hotel industry (Pham et al., 2020), the airline industry (Liljander et al., 2006), the m-commerce industry (Roy & Moorthi, 2017), financial service sector (Walczuch et al., 2007), manufacturing and energy industry (Yali Zhang et al., 2020), retail industry (Elliott et al., 2013), education (El Alfy et al., 2017; Yi & Moon, 2021), and sports and fitness industry (Kim & Chiu, 2019). Current literature ignored the importance of measuring the technology readiness of apparel firm managers in the context of sustainability. Existing literature has not addressed the factors impacting apparel managers' sustainable technology readiness. Furthermore, prior studies lack evidence of measuring apparel managers' adoption intention toward sustainable technology.

In summary, three research gaps are identified. First, individual managers' readiness toward sustainable technology was not examined in previous studies in the context of the apparel industry. Second, individual managers' adoption intention of sustainable technology was also ignored in the existing literature. Third, though Bangladesh has become an essential part of the global apparel supply chain, existing literature lacks the investigation of sustainable technology adoption in the context of the Bangladeshi apparel industry.

As Bangladesh is upgrading its apparel industry by promoting technology advancement and embracing and launching sustainability initiatives, it is time to study the issues related to industry managers' technology readiness and their adoption intention toward sustainable technology in the Bangladeshi apparel industry. Thus, this dissertation aims to fill the above three literature gaps.

Research Purpose and Objectives

This dissertation investigated the factors affecting the adoption intention of apparel firm managers toward sustainable technology. The study proposed sustainable technology readiness as one of the key factors affecting the intention of managers to adopt sustainability-related technology in apparel firms. Furthermore, it is crucial to understand the antecedents influencing apparel managers' readiness toward sustainable technology. Moreover, it is also important to analyze other factors affecting apparel managers' intention to adopt sustainable technology. Given the aforementioned literature gaps, this study aimed to investigate the issues related to technology readiness toward and adoption intention of sustainable technology by apparel firm managers in the context of the Bangladesh apparel industry. To address this purpose, the dissertation has the following three objectives:

Objective 1: To investigate the relationships between managers' knowledge and involvement in technology and their readiness toward sustainable technology. Through a comprehensive literature review, the study identified the important factors (different types of knowledge and involvement of the managers) impacting the technology readiness of apparel firm managers in the context of sustainability. Through the analysis of the primary data collected from Bangladesh's apparel professionals, the relationship between managers' sustainable technology readiness and their knowledge and involvement was investigated using advanced statistical techniques.

Objective 2: To examine the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness. This dissertation investigated how apparel managers' education (what level of education they completed) and their experience (how long they have worked in the industry) impact the relationships between their knowledge and involvement and their sustainable technology readiness.

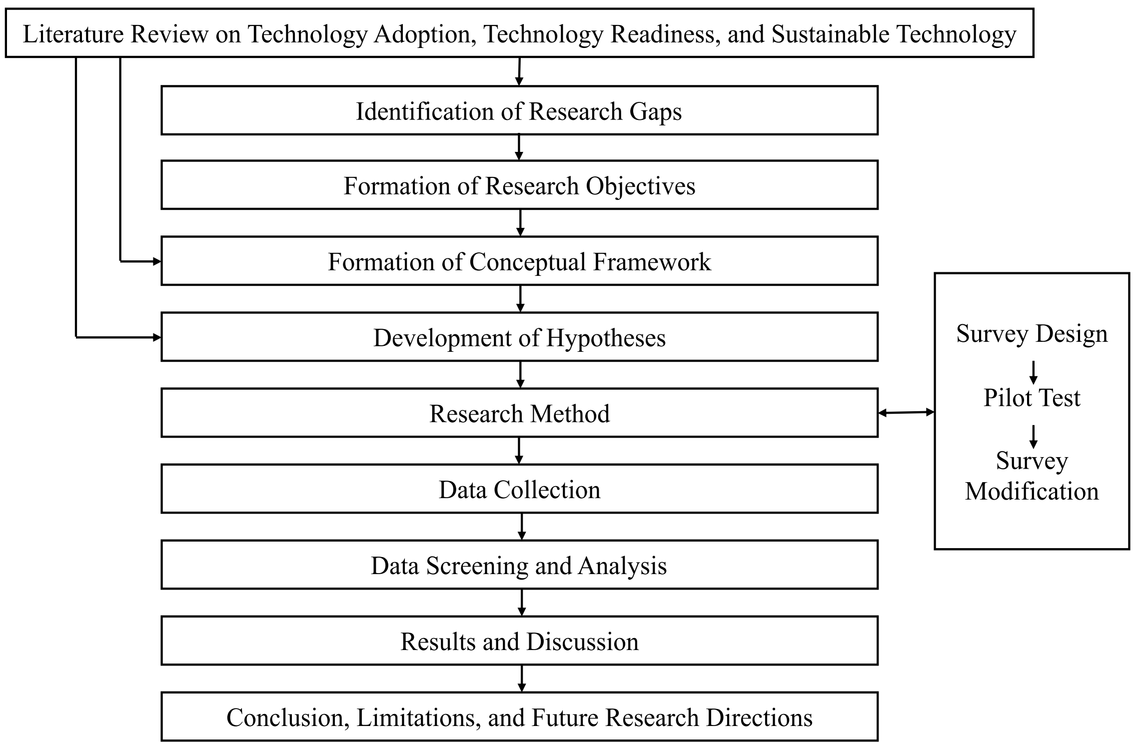
Objective 3: To investigate how apparel managers' sustainable technology readiness, their perceptions of social influences, facilitating conditions, and relative advantage of sustainable technology impact their intention to adopt sustainable technology. Besides sustainable technology readiness as a core factor affecting managers' intention toward adopting sustainable technology, through a comprehensive literature review, the dissertation identified several other important factors, including social influence, facilitating conditions, and relative advantage. It further examined how these factors affect the managers' adoption intention toward sustainable technology in the context of the apparel industry in Bangladesh.

Research Design

As discussed in detail in Chapter III, the research design addressed the three objectives stated in the previous section. Figure 2 illustrates the proposed research design in this study. The design for the proposed dissertation was guided by a comprehensive literature review. The extensive literature review leaded to the development of research hypotheses in light of a theoretical framework. The theoretical framework was developed by integrating the technology readiness index (TRI) (Parasuraman, 2000), the diffusion of innovation theory (DOI) (Rogers, 1995), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). After the development of the hypotheses and the conceptual framework, the study empirically investigated the relationships illustrated in the conceptual framework and stated in the hypotheses.

A survey instrument was developed based on the literature. The scale items used to measure the constructs in the conceptual model were adapted from the previous literature related to technology readiness, sustainable technology, and technology adoption. For data collection, a sample of apparel managers in Bangladesh's apparel industry was asked to complete the online survey. The sample unit was individual managers, and the valid sample size was 221. The hypotheses were tested using structural equation modeling.

Figure 2. Research Design Diagram



Scope and Significance

There are multiple implications for this dissertation. First, this research contributes to the literature on sustainability, technology adoption, and technology readiness in the apparel manufacturing context. Particularly, the study focused on sustainable technology readiness and adoption by apparel professionals, which is little addressed by previous researchers. The global apparel industry is facing an increased amount of pressure to meet sustainability requirements. Though the primary source of this pressure is the end consumers, this pressure is converted into different environmental regulations imposed by fashion brands and retailers on apparel manufacturers (Islam et al., 2021). Technology adoption by manufacturers is considered one of the essential steps to address these sustainability regulations (Bag et al., 2021; Islam et al., 2021).

In this context, it is vital to investigate and understand whether the professionals working in apparel manufacturing are ready to adopt the technologies that help meet sustainability requirements. Understanding the technology readiness of the workforce working in the industry helps initiate technological transformation. By analyzing the empirical data collected from Bangladesh's apparel professionals, the study provides a deep understanding of sustainable technology readiness and adoption intention by Bangladeshi apparel managers. As sustainable technology-related empirical research is scarce in the context of the apparel industry, this study serves as important empirical proof of the importance of sustainable technology adoption in the apparel industry.

Second, theoretically, this study expands our understanding of the causal flow among cognitive variables of the apparel firm managers, including their knowledge, personal involvement, technology readiness, and adoption intention toward sustainable technology. Sustainable technology-triggered transformation (Parasuraman & Colby, 2015) is likely to accelerate in the apparel industry in the future because more and more technologies will be applied in the apparel industry to contribute to increased efficiency, productivity, energy saving, water saving, and waste reduction. This sustainable technology transformation will ultimately help the apparel industry address sustainability-related issues (Al-Ashmori et al., 2022; Caldarelli et al., 2021; Enyoghasi & Badurdeen, 2021; Park, 2020). Therefore, it is crucial to understand the antecedents of the apparel managers' technology readiness and the factors impacting their adoption intention toward sustainable technology. This dissertation provides empirical evidence on the role of apparel professionals' characteristics (e.g., knowledge and involvement) in their sustainable technology readiness. Furthermore, the study tests how sustainable technology readiness, social influence, facilitating conditions, and relative advantage influence adoption intention toward sustainable technology.

Third, the findings of this study shed light on our understanding of how education and experience can be influential variables in technology adoption literature, especially in the sustainable technology adoption literature. This study investigates the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement with technology and their sustainable technology readiness. The findings directly help the apparel firms' top management understand and evaluate their managers' readiness toward technologies that helps in achieving sustainability-related goals.

Fourth, the results of this study are also important for the government and other policymakers in rocketing the use of sustainable technologies in the apparel industry. The findings may help the government initiate and regulate clean energy policies in the apparel industry. When the government and other policymakers understand the adoption intention and readiness of the apparel firm managers toward sustainable technology, they will be able to formulate favorable import tax policies for sustainable technologies. The apparel industry is the primary industry in Bangladesh. When the majority of apparel firms in Bangladesh start adopting sustainable technologies, it will be easier for Bangladesh to meet the Sustainable Development Goals (SDG), especially goal number 12 (Responsible Consumption and Production) and 13 (Climate Action) (SDGS, 2022). Furthermore, the government may develop strategies to support and train apparel managers to adopt sustainability-related technologies within an established sustainable investment. Moreover, the findings of this study will help the apparel industry in other countries assess the readiness and intention of their workforce to adopt new and sustainable technology in the future.

Bangladesh is transitioning from a lower to a middle-income country. Its apparel industry has achieved impressive status as the second-largest apparel product exporter in the world. If the government of Bangladesh wants to ensure the sustainable development of the apparel industry, they need to focus on both technological capability and sustainability. To ensure technological capability and sustainability in apparel firms, understanding the technology readiness and adoption behavior of apparel firm managers is critical. Therefore, the findings of this study will help Bangladesh's government and apparel industry formulate relevant policies for their sustainable apparel business.

Definition of the Key Terms

This section includes the definitions of the key terms used in this dissertation. The definitions are formatted and presented in the following table:

Table 1. Definition of the Key Terms

Term	Definition
Apparel Firm	This dissertation defines apparel firms as manufacturing factories where apparel products are manufactured, though the basic operations performed in an apparel firm vary greatly in terms of the final product (whether the final product is knit, woven, or non-woven). Typically, pattern design, marker making, fabric cutting, sewing, trim assembling, washing, finishing, packaging, and other related operations are performed in a typical apparel firm.
Apparel Firm Managers	This dissertation defines apparel firm managers as professionals working for a period of time in manufacturing factories where the apparel products are manufactured. Managers of apparel firms might be engaged in different types of operations, including pattern design, marker making, fabric cutting, sewing, trim assembling, washing, finishing, packaging, merchandising, supply chain, inventory management, and so on.
Facilitating Conditions	Facilitating conditions can be referred to as individuals' belief in the support and resources available to them for accomplishing a behavior (Dwivedi et al., 2007; Venkatesh et al., 2012).
Personal Involvement	Personal involvement is the interest or the motivational state of stimulation of an individual towards objects as aroused by the desires, values, and needs, and the extent to which those objects are perceived as personally connected (O'Cass, 2004; Zhang & Kim, 2013).

Relative Advantage	Relative advantage can be referred to as the benefits of a new product or technology application over other alternatives (Arts et al., 2011; Rogers, 1995). Relative advantage is the extent to which a technology is considered superior to the innovations it has replaced (Ullah et al., 2021).
Social Influence	Social influence refers to the degree to which individuals perceive that other people who are important in their life think that they should adopt and use a particular technology (Baishya & Samalia, 2020; Venkatesh et al., 2012).
Sustainability	• Sustainability is an expansive concept that is comprehended differently across cultures and disciplines (Aminpour et al., 2020; Kates, 2011). According to Kidd (1992), the perception of sustainability is profoundly rooted in fundamentally different concepts, and for this reason, it is difficult to have a single definition of sustainability. • The most popular definition comes from the document named "Our Common Future," commonly known as the 1987 Commission's report (Brundtland, 1987). This report defines sustainable development and sustainability as the "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." • With the expansion of the definition of sustainability, some interconnected paradigms have indicated society, economy, and environment as the most important three pillars of sustainability (Aminpour et al., 2020). • Goodland (1995) argued that sustainability has three paradigms: the first one is social sustainability which can be achieved by community engagement and participation for sustaining social capital; the second one is environmental sustainability which intends to maintain natural capital and improve human well-being, and the third one is economic sustainability which relates to the financial capital maintenance. • From the environmental perspective, the best definition was given by Dincer (2000) as "sustainability is concerned with the reduction in energy consumption, shifting away from fossil fuels, and energy conservation."
Sustainable Technology in the Apparel Industry	The technologies that are useful in addressing the sustainability issues in the textile and apparel industry in terms of reduction of chemical and water use, carbon emission and textile waste (Niinimaki et al., 2020), consumption of natural resources (Hiller Connell & Kozar, 2017), waste generation (Shirvanimoghaddam et al., 2020), use of toxic chemicals, energy use (Muthukumarana et al., 2018), and water pollution (Hossain et al., 2018). Furthermore, the technologies that help the stakeholders of the apparel supply chain in addressing the economic, social, and environmental aspects of sustainability can be termed sustainable technology (Niinimaki et al., 2020).
Technology Adoption	Technology adoption can be defined as the decision taken by an individual or firm to implement and utilize a technology (IGI Global,

	2021). In simple words, technology adoption is the process through which a technology is accepted by an individual or organization (Davis, 1989).
Technology Readiness	Technology readiness can be defined as people's propensity to embrace and use new technologies to accomplish goals in work life and at home (Parasuraman, 2000). It can be regarded as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine the predisposition of a person to use novel technologies (Parasuraman, 2000).

Outline of the Dissertation

This dissertation comprises five chapters. Chapter I describes the background of the research and addresses the research gaps in the literature and the research purpose and objectives. The research design is briefly explained, along with the scope and significance of the study. The chapter concludes with definitions of key terms.

Chapter II provides a thorough review of the literature on the research topic. The chapter addresses the theoretical foundations of the study and presents the proposed research framework and hypotheses.

Chapter III explains the methodology that was used in the study. A summary of the data analysis approach is also described.

Chapter IV provides the analysis of the data and reports the results of structural equation modeling. The chapter also provides the results of hypotheses testing.

Chapter V discusses and concludes the findings of this dissertation. This chapter explains the implications, limitations, and future research recommendations.

CHAPTER II: LITERATURE REVIEW

As addressed in Chapter I, this dissertation aimed to investigate the issues related to technology readiness toward and adoption intention of sustainable technology by apparel firm managers in the context of the Bangladesh apparel industry. This chapter provides a thorough review of relevant literature on the major concepts and presents the theoretical framework of the proposed dissertation. To this end, this chapter is structured as follows: (1) Apparel Industry of Bangladesh, (2) Sustainability, (3) Sustainability in the Global Apparel Supply Chain, (4) Technology Adoption in the Apparel Industry, (5) Technology Readiness, (6) Sustainable Technology, (7) Theoretical Groundings, and (8) Hypotheses Development.

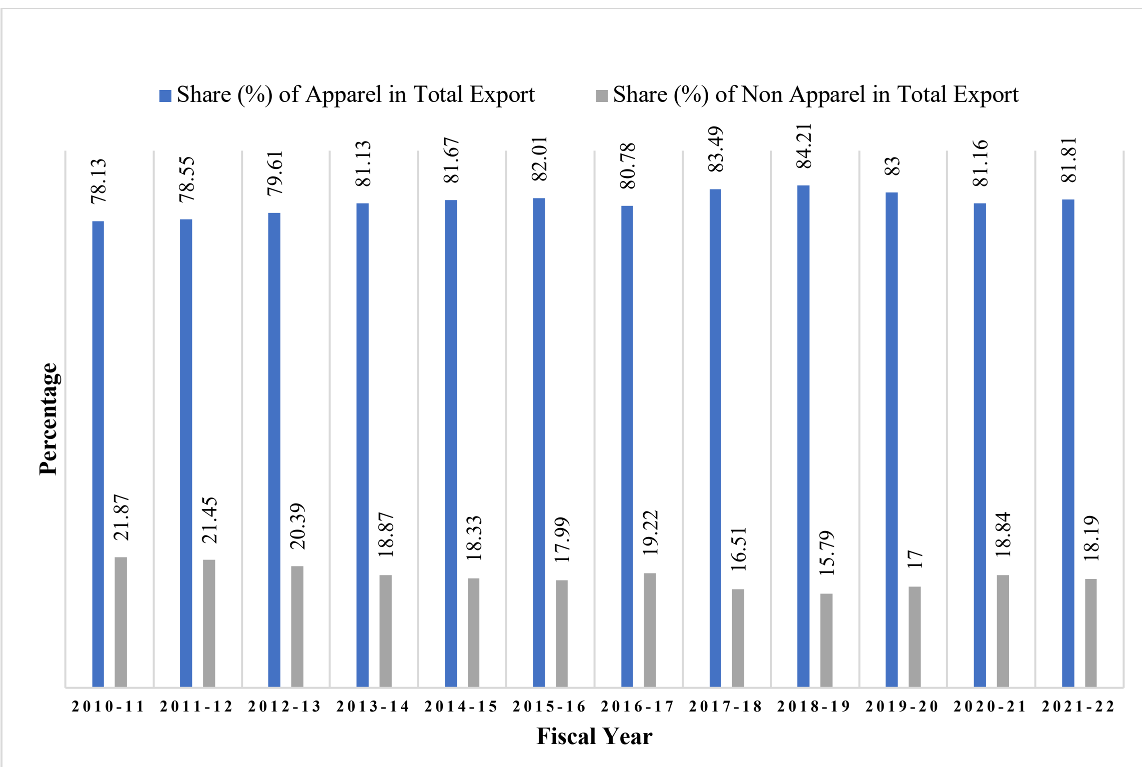
Apparel Industry of Bangladesh

Bangladesh achieved its independence in 1971 through nine long months of the liberation war, and then it was ranked as one of the poorest countries in the world. Initially, Bangladesh's development potential and growth prospects were not satisfactory, and it emerged as an aid-dependent nation. While going through a hard time, the government of Bangladesh took some restructuring measures, including the 'new industrial policy 1982' and the privatization of government-owned industries. Along with these government policy reforms, some privately owned export-oriented apparel firms emerged in the scenario that gave a steady momentum to the economy of Bangladesh (Islam et al., 2016). These reforms resulted in a sharp increase in employment in this industry. For example, there were only 134 apparel firms in Bangladesh employing workers of around 0.04 million in 1984, and the number went to 5876 (BGMEA, 2022) apparel firms employing workers of around 4 million. Both government and entrepreneurs received the credit for this phenomenal growth in the apparel industry (Islam, 2021).

Apparel manufacturing firms have emerged as a prominent sector of the economy of Bangladesh (Bhogal & Govind, 2021). This industry plays a significant role in the economy by offering direct and indirect employment to more than 5 million people (Bangladesh Bureau of Statistics, 2022; Islam, 2021). Most of these workforces are semi-skilled or unskilled (Iqbal et al., 2022) and have migrated from the rural areas of Bangladesh. Interestingly, around 90% of these workforces are women (BGMEA, 2022). So, the apparel industry of Bangladesh is directly contributing to the financial independence and empowerment of women in Bangladesh (Islam, 2021; Islam et al., 2016).

As per the suggestions from different economic theorists, export earnings are one of the primary determinants of economic growth (Emery, 1967). A nation can accelerate its economic growth rate by escalating export earnings; therefore, export earnings are a nation's "engine of growth" (Emery, 1967; Swazan & Das, 2022). Among the leading apparel exporters in the world, Bangladesh ranked third (6.4% of the total global apparel export), holding its position just after China and the European Union in 2021 (Statista, 2021). The share of China and the European Union of the total global apparel export was 32.8% and 28.1%, respectively, in 2021 (Statista, 2021). Export earnings of Bangladesh are contributed significantly by apparel exports in the last decade (Islam, 2021; Swazan & Das, 2022). For example, apparel export contributed 84% of the total foreign exchange earnings of Bangladesh in the fiscal year 2018-2019, which also contributed to more than 10% (World Bank, 2019) of the GDP of Bangladesh (Bangladesh Bank, 2022; Export Promotion Bureau of Bangladesh, 2022). Bangladesh maintained a continuous growth of apparel export which has been its primary source of foreign currency income. Figure 3 illustrates how apparel export has constantly contributed to the export income compared to non-apparel export income. This figure also depicts the apparel industry's importance in Bangladesh's economic development. Bangladesh exported apparel products for $35.81 billion in the 2021 (Export Promotion Bureau of Bangladesh, 2022) and regained the position of the second-largest apparel exporter in the world after China. In 2020, Bangladesh lost its position as the second-largest apparel exporter to Vietnam. Vietnam earned $29.80 billion in 2020, while Bangladesh earned $28 billion from apparel exports to the world. However, Bangladesh regained its second-largest apparel exporter position in 2021 with a $35.8 billion export value. Knitwear product export contributed better compared to the woven products export. Knitwear product export in the year 2021 was $19.59 billion, and woven products brought $16.21 billion in the export (Export Promotion Bureau of Bangladesh, 2022).

Figure 3. Share (%) of Apparel and Non-Apparel Goods in Total Export of Bangladesh to the World

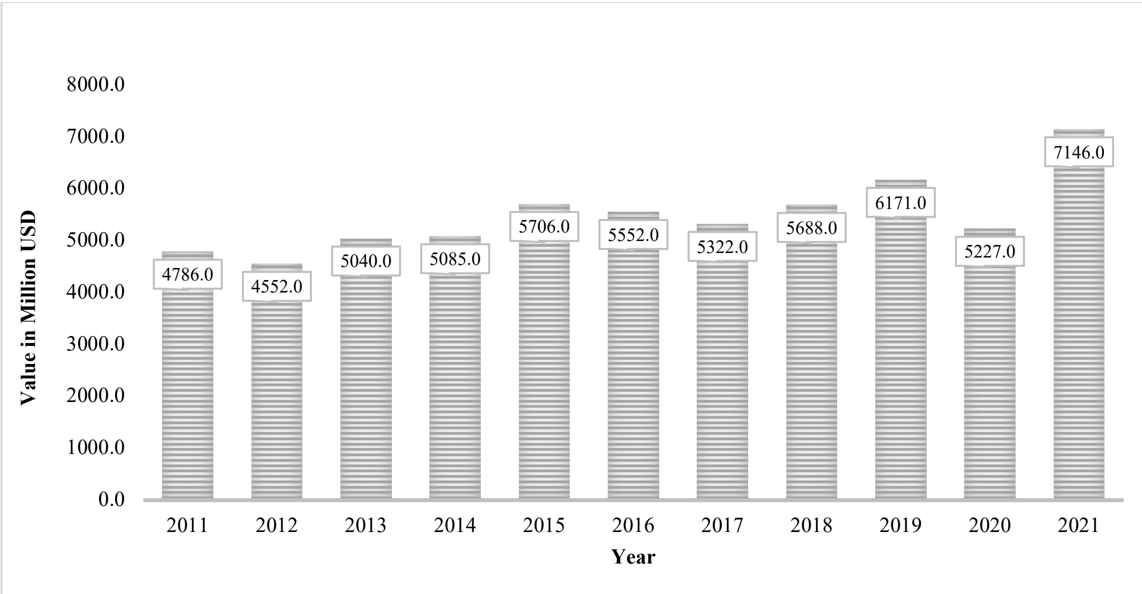


Note. Data were collected from the Export Promotion Bureau of Bangladesh (2022)

Bangladesh maintained steady growth in apparel export until 2019. But, as COVID-19 started impacting global business, Bangladesh went through a more challenging time exporting apparel products. With the COVID-19 outbreak in March 2020, the production of apparel firms was hampered due to the government-enforced lockdown. Despite the impact in 2020, Bangladesh regained a strong recovery as the apparel export earnings grew by 30.36% in 2021 compared to 2020.

In 2021, total apparel imports of the US from the world increased by 27.36% compared with 2020. The United States imported more than $7.1 billion in apparel products from Bangladesh in 2021, which is 36.69% higher than the previous year and contributed to 8.76% of the total US apparel import from the world in 2021 (OTEXA, 2022). Figure 4 illustrates US apparel imports from Bangladesh. The increase in the share of apparel imports from Bangladesh in the US market indicates the increased importance of Bangladesh as an apparel sourcing (Su et al., 2022b) destination for US apparel businesses (OTEXA, 2022; World Bank, 2022). Apart from general knit and woven products, denim apparel products from Bangladesh grabbed the attention of US retailers. The denim export by Bangladeshi apparel firms gripped 22.47% of the total denim import value of the US in 2021 (OTEXA, 2022; World Bank, 2022).

Figure 4. US Apparel Import from Bangladesh

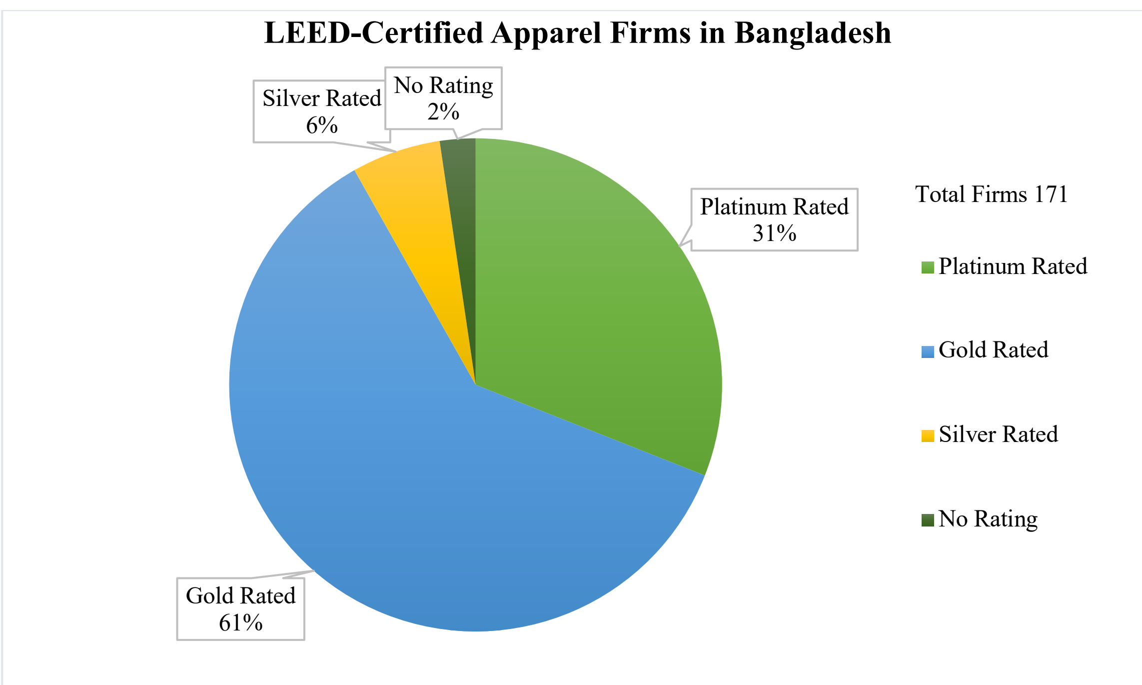


Note. The data sources: OTEXA (2022) and World Bank (2022).

Though the apparel industry of Bangladesh experienced continuous growth, it faced some major challenges regarding social and environmental safety. In Bangladesh, the Rana Plaza collapse (on April 24, 2013) exterminated over 1,100 people who were apparel firm workers (Jacobs & Singhal, 2017). Another big incident for the Bangladeshi apparel industry was the Tazreen Fashions fire tragedy (in November 2012) that took 112 lives of apparel firm workers. After these shocking events, the Bangladeshi apparel industry was in deep trouble ensuring workers' safety and meeting other sustainability-related goals demanded by western buyers. Bangladeshi apparel manufacturers faced enormous pressure to maintain the economic, social, and environmental standards of apparel production. But ultimately, Bangladeshi apparel firms responded to these pressures in a professional way. Even the government of Bangladesh put effort into bringing discipline to maintaining workplace safety at apparel firms. Apart from the government initiatives, retailers and global brands took major initiatives through the establishment of the Alliance for Bangladesh Worker Safety ("Alliance") and the Bangladesh

Accord on Fire and Building Safety ("Accord") (Ahlquist & Mosley, 2021). It has been almost a decade since the Rana Plaza tragedy, but Bangladesh did not lose its competitiveness in the global apparel market; Bangladesh is exporting apparel products with a steady growth rate every year. The Bangladeshi apparel industry is performing well in different sustainability initiatives. For example, many factories are achieving different global sustainability certifications, including LEED. LEED (Leadership in Energy and Environmental Design) is an ecology-oriented building certification program run under the umbrellas of the U.S. Green Building Council (USGBC). There are 171 LEED-certified apparel firms in Bangladesh; among them, 53 are platinum-rated (USGBC, 2022). Figure 5 illustrates the ratings of 171 LEED-certified apparel firms in Bangladesh. In 2022, among the world's highest-rated 10 LEED-certified industrial entities, seven are apparel manufacturing units from Bangladesh (BGMEA, 2022; USGBC, 2022).

Figure 5. LEED-Certified Apparel Firms in Bangladesh



Note. The figure is compiled by the researcher based on the data collected from USGBC (2022).

The apparel industry of Bangladesh is identified as a cheap labor industry and also recognized as a low-value garments-producing industry (Islam et al., 2013). The cheap labor in Bangladesh provides a sharp competitive advantage over other countries (Islam, 2021). On the other hand, these rural, illiterate, and unskilled workers present challenges for the industry to produce high-value products. Apart from the unskilled workers, there are some other challenges mentioned by previous research. Islam et al. (2016) stated that insufficient infrastructure, energy crisis, workplace safety, social compliance, political crisis, inability to diversify products and market, and lack of backward linkage industry are the primary challenges of the Bangladeshi apparel industry. In addition, Islam et al. (2013) noted that lack of research and development (R&D), lack of technology modernization, and gas and electricity crisis are the most commonly addressed challenges and threats for the Bangladeshi apparel industry.

Sustainability

Sustainability is a broad concept comprehended differently across cultures and disciplines (Aminpour et al., 2020; Kates, 2011). According to Kidd (1992), the perception of sustainability is profoundly rooted in fundamentally different concepts, so it isn't easy to have a single definition of sustainability. World Commission on Environment and Development defined sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their needs" (Gerasimova, 2017, p. 79). Another widely accepted definition of sustainability says "a wise balance among economic development, environmental stewardship, and social equity" (Sikdar, 2003, p. 1928). With the expansion of the definition of sustainability, some interconnected paradigms have indicated society, economy, and environment as the three most important pillars of sustainability (Aminpour et al., 2020). Goodland (1995) argued that sustainability has three paradigms: social sustainability, which can be achieved by community engagement and participation in sustaining social capital; environmental sustainability, which intends to maintain natural capital and improve human well-being; and economic sustainability, which refers to financial capital maintenance. From the environmental perspective, Dincer (2000) gave the best definition: "sustainability is concerned with the reduction in energy consumption, shifting away from fossil fuels, and energy conservation."

One of the newer thoughts on sustainability is the "Triple Bottom Line" (Elkington, 2004). This concept consists of economic, social, and environmental performance aspects (Elkington, 2004). The three aspects of Triple Bottom Line have been well-defined by the Sustainability Society Foundation: environmental well-being consists of climate and energy, a healthy environment, and natural resources; human well-being includes the social performance that refers to basic needs, a well-balanced society, personal development; economic wellbeing is associated with planning for the economy and future (Sustainable Society Index, 2022). This "Triple Bottom Line" concept is also popular as "People, Planet, and Profit." The global apparel supply chain is labor-intensive in nature and sensitive to society and the environment. Therefore, maintaining a sustainable supply chain is crucial for apparel firms that cover all aspects of sustainability (Li et al., 2014).

Sustainability in the Global Apparel Supply Chain

Sustainable supply chain management (SSCM) can be defined as the transparent, strategic integration and achievement of environmental, social, and economic goals in the systemic coordination of key inter-organizational processes (Carter & Rogers, 2008). SSCM aims to improve the long-term economic performance of the business and its supply chains. The global apparel industry is one of the focal industries that consider sustainability as a core element to protect the environment and ensure a better work environment for workers. Sustainable apparel has already attracted considerable attention from both academic and industrial scholars within the domain of textile and apparel supply chain management (Morana & Seuring, 2011). The sustainable apparel supply chain consists of sustainable-raw material preparation, sustainable manufacturing, green retailing and distribution, and consumers with sustainable and ethical behavior (Shen et al., 2014). In the context of a retailer, an effective, sustainable apparel supply chain can help the retailer enhance the brand's image and reach more conscious consumers (Faisal, 2010). While in the context of a manufacturer, an effective, sustainable apparel supply chain can help the firm manufacture apparel products with less consumption of resources and ensure waste reduction and workplace safety (De Brito et al., 2008). So, meeting sustainability-related goals is a way for firms to promote their social and environmental responsibilities to achieve a competitive advantage in the market (Shen, 2014; Yang et al., 2010).

Consumers are nowadays more concerned about the social and environmental consequences of their buying behavior (Dickson, 1999). This increased concern from the consumers put pressure on the whole supply chain (Khan & Islam, 2015). As a result, every tier of suppliers and manufacturers receives pressure from their upper tier to maintain the sustainability requirements. Manufacturing apparel products sustainably is associated with environmental protection and human rights. Apparel manufacturing often takes place in countries where the labor cost is too low. But it is commonly seen that, in those countries, the environment and social awareness are not advanced up to the mark (Shen, 2014). In Bangladesh, after the

Rana Plaza and Tazreen Fashions tragedies, the manufacturers have felt increased pressure to maintain sustainability standards.

There are numerous environmental impacts of the apparel industry. Around 65% of potential global warming happens from the fiber generation stage to the stage of use when end consumers extensively launder, wash, dry, and iron their clothes (Denuwara et al., 2019; Muthukumarana et al., 2018). The global apparel industry causes 2.1 million tons of carbon dioxide emissions each year (Denuwara et al., 2019). Furthermore, this industry is responsible for destroying over 100 million trees each year, with 30% of those from endangered and ancient rainforests for meeting the demand for viscose, rayon, and modal fiber-made garments (Denuwara et al., 2019; Farra, 2019; MacCarthy, 2019). There are some other environmental and social impacts of the apparel industry too. For example, the monetary value of the societal damage from pesticide use in the United States is around $9.6 billion per year (Pimentel, 2005). Tremendous use of irrigated water, soil erosion, and imbalanced resource use are some common impacts of the cotton manufacturing industry. Globally, per year, the apparel industry produces around 150 billion garments; however, 30% of those are never sold, causing 92 million tons of textile waste (Chung, 2019; Farra, 2019). Moreover, a large portion of waste is generated during the manufacturing stage, which is a huge resource loss in terms of materials and energy. Even though the impacts of the apparel industry on the environment are high, it is feasible to recuperate the condition by exploiting sustainable technologies and processes (Denuwara et al., 2019). Table 2 illustrates the impacts of the apparel industry on the environment.

Table 2. Impact of the Apparel Industry on the Environment

Area of Impact	Impact of the Apparel Industry on the Environment

Global warming	65% of potential global warming happens from cultivation to the stage of use when consumers extensively wash, launder, and iron their clothes (Denuwara et al., 2019; Muthukumarana et al., 2018).
Carbon-dioxide emission	2.1 million tons of Carbon-dioxide emissions are produced by the apparel industry each year (Denuwara et al., 2019; Farra, 2019; Muthukumarana et al., 2018).
Deforestation	Over 100 million trees are cut down each year to make fabric such as rayon, viscose, and modal for apparel, with 30% of those from endangered and ancient rainforests (Denuwara et al., 2019; Farra, 2019; MacCarthy, 2019).
Waste generation	The global apparel industry produces 150 billion garments per year; however, 30% are never sold, generating 92 million tons of textile waste (Chung, 2019; Denuwara et al., 2019; Farra, 2019).

We live in a consumer-driven economy. There is an increasing force of eco-awareness from consumers, which links firms' competitiveness with sustainability in the apparel industry (Denuwara et al., 2019). Though apparel firms are end-product manufacturers, sustainability practices should be integrated into the whole supply chain, which includes spinning, knitting, weaving, dyeing, finishing, washing, and other operations. The objectives of sustainability practices are the reduction of water and chemical use, carbon emissions, textile waste, toxic chemicals use, energy usage, and water pollution and carbon emissions (Connell & Kozar, 2017; Hossain et al., 2018; Muthukumarana et al., 2018; Niinimaki et al., 2020). Implementation of sustainability practices enables a firm to maintain a competitive advantage (Li et al., 2016), gain strategic benefits, support the sustainable development of the apparel supply chain (Todeschini et al., 2017), and address the overall scarcity of resources (Desore & Narula, 2018). As this industry is constantly exposed to public perception, apparel firms must formalize a deliberated approach toward sustainability to have a strategic advantage and organizational growth (Macchion et al., 2018).

According to Grieco et al. (2017), sustainable practices can be implemented in apparel manufacturing through technology and strategic management. Apparel firms can find a competitive advantage in terms of quality, productivity, waste minimization, and resource optimization by using different levels of automation and advanced technologies (Islam et al., 2013; Islam et al., 2020; Todeschini et al., 2017). Technology can accelerate the growth and progress of firms in a manufacturing environment (Fu et al., 2018; Islam et al., 2020). Especially in developing countries, the adoption of information and manufacturing technology can deliver tremendous opportunities for apparel firms to foster performance and, at the same time, assist the firms in addressing sustainability requirements (Bag et al., 2021; Islam et al., 2020).

Technology Adoption in the Apparel Industry

A firm's competitive advantage (Teece & Pisano, 2003) depends on several production factors (Lall, 1992), but one of the most significant production factors is technological capacity. Technology and innovation are the key driving forces for achieving and maintaining a competitive advantage in a firm (Schumpeter, 1934; Solow, 1956). Technology adoption has become a noticeable trend in the textile and apparel industry in the last two decades. The existing literature on the adoption of innovation and technology illustrates the application of adoption theories and identification of determinants of technology adoption at both the firm and individual levels (Tidd, 2001; van Oorschot et al., 2018). Some researchers focused on export performance (Rasiah, 2007) and technological capacity (Teece et al., 1997). Some other researchers focused on influencing factors (Park-Poaps et al., 2020), including firm size, economic performance (Rasiah, 2006), and ownership structures of a firm (Varukolu & Park-Poaps, 2009). While previous literature examined how industry-level performance relates to technological capacity (Teece et al., 1997), this study focuses on technology adoption at the individual level. The following paragraphs discuss the literature regarding the major technologies adopted in the apparel industry.

Information Technology (IT)

The potential use of information technology (IT) in the textile and apparel industry is associated with financial and operational performance. IT influences apparel retailers' online business competencies (Ding et al., 2011). The study by Andersen and Segars (2001) was one of the pioneering studies on IT adoption in apparel firms. They inspected the effect of IT adoption on apparel firms in the USA (Andersen & Segars, 2001). According to their research, IT can enhance internal communication, which is associated with greater financial performance. They also found that utilizing IT to enhance communication directly impacts how well large organizations perform. According to Luo et al. (2012), IT plays a vital role in ensuring the innovation of products and services, operation efficiency, better customer service, and overall development of organizational capabilities. Existing literature also suggests that adopting the same level of IT may not result in the same level of efficiency, which varies across the different apparel supply chains (Jin, 2006). The firm's financial resources and size (Iqbal & Su, 2021) play a significant role in the adoption of IT by apparel firms (Jin, 2006; Luo et al., 2012).

Computer-Aided Design (CAD)

The existing literature depicts that the adoption of Computer-Aided Design (CAD) by the textile and apparel industry started early in the 1990s (Volino et al., 2005). The accelerated use of CAD in the apparel industry was mainly caused by revolutionary digital technology, which improved apparel design and manufacturing processes. From the studies of Hinds et al. (1992) and Sayem et al. (2010), it became clear that the apparel manufacturers adopted CAD in order to reduce the time for product development significantly and to enhance efficiency as CAD provides options for trial and error before actual fabric cutting (Zhang et al., 2016). Sayem et al. (2010) and Hinds et al. (1992) reviewed the chronological developments of 3D CAD systems for the apparel industry and assessed the features of currently accessible systems on the market. Their articles mainly focused on different computer-aided technologies that help firms in designing virtual garments, both from '2D to 3D' and '3D to 2D'.

According to Yan and Fiorito (2007), CAD is enormously beneficial for apparel firms as CAD-related technologies are positively associated with lead time reduction (external influence), but the adoption of CAD-related technologies is restricted by the shortage of skilled workers and firm size (internal influence). Meng et al. (2012) explained the transformation of CAD technology from 2D to 3D and contended that the 3D technology with human interactivity features provided additional benefits to product specification accuracy as well as apparel manufacturing. Tao and Bruniaux (2013) found that using cyberspace as a combination of CAD, artificial intelligence, and industrial internet offers a greater ability for firms to respond faster in apparel manufacturing operations. The findings of Liu et al. (2010) and Lu et al. (2017) suggested that the 3D CAD technology reversed the traditional method by getting inputs from the body measurement and making two-dimensional printable patterns. Traditionally, three-dimensional apparel products are made from two-dimensional patterns and fabrics. Modernized 3D-CAD systems come with features that enable "virtual garment production and garment fit testing" (Hoque et al., 2021). Thus, the lead time for product development cycles can be significantly shortened by 3D CAD systems, and factories can successfully adapt to the demand for an agile supply chain. Computer-aided manufacturing (CAM) was introduced a little after CAD when mechatronics, a unified field of mechanical and electrical engineering, brought a combination of hardware and software aspects to design, cutting, sewing, and packing activities (Hoque et al., 2021; Sayem et al., 2010). Recently, the sophisticated and integrated CAD-CAM system has provided a superior prospect to the apparel industry to enhance agility and product quality and reduce lead times (Burke & Sinclair, 2015).

Radiofrequency Identification (RFID)

The use of radiofrequency identification (RFID) in the apparel supply chain minimized human interaction (Hoque et al., 2021). RFID technology is a well-known and somewhat established technology. It employs radio waves to communicate data from RFID tags to an RFID reader. The technology is mainly used to identify information about the things to which it is attached or to track the objects' locations (Denuwara et al., 2019). RFID tags are comparable to barcodes from the identification standpoint, but RFID tags are not constrained by the line-of-sight capabilities that come with the optical scanning of a barcode tag; products can be scanned without the restrictions on the direction near a suitable reader (Denuwara et al., 2019). RFID technology is used to track and transfer the products or components of products and to achieve faster and error-free responses throughout the supply chain. So, adopting RFID technology has become an increasing phenomenon among apparel stakeholders, including forward and backward linkages.

According to the findings of Azevedo and Carvalho (2012), RFID adoption promotes some benefits, including faster distribution, efficiency, faster response, and speedy logistics. Some researchers argued that despite the potential uses of RFID, the textile and apparel industry implemented this technology in a limited scope (Legnani et al., 2011). Legnani et al. (2011) provided the implication of RFID technology adoption, along with its requirements, opportunities, and challenges in the textile and apparel industry. Their article discussed the infrastructure, standards, and skilled workforce as requirements to adopt RFID, and operational efficiency, quick response production, and fast distribution as opportunities for adopting RFID.

They also mentioned that cost and privacy are the main challenges in adopting RFID. Azevedo and Carvalho (2012) examined the factors and drivers of RFID adoption through a case study in eight firms, including four retailers, one distributor, and three manufacturers. Their findings suggested that all eight firms achieved on-time delivery of the orders and minimized the stock-outs. Other benefits suggested by this case study are reduced time for material handling, improved visibility of materials and containers in the apparel supply chain, and cost reduction. Another case study by Chan (2016), which was conducted on Marks and Spencer, Zara, and other retailers, also found that RFID adoption facilitates substantial improvement in inventory management and product-flow visualization in the apparel supply chain. In addition, Wong et al. (2014) conducted a case study to explore the feasibility of the smart dressing system (SDS) combined with RFID. Their findings suggested that SDS, combined with RFID, is able to collect real-time data with an analytical feature for predicting shopping taste changes of consumers.

Industry 4.0 (I4.0) in the Apparel Supply Chain

In recent times, the technologies like artificial intelligence (AI), blockchain technology, the internet of things (IoT), augmented reality (AR), smart robots, 3D printing, cloud computing, and big data analytics are considered Industry 4.0 (I4.0) technologies (Gupta et al., 2021). These technologies are advanced in nature and can enable state-of-the-art applications in the apparel industry. They differ from traditional technologies but have a close connection with them. For example, the I4.0 technology internet of things (IoT) can be conceptualized and applied as a super-advanced form of RFID, and I4.0 technologies such as artificial intelligence (AI), blockchain technology, cloud computing, and big data analytics can be conceptualized and applied as a super-advanced form of information technology (IT) (Hoque et al., 2021; Zutin et al., 2022).

In 2011, the term "Industry 4.0 (I4.0)" was first introduced by the government of Germany, aiming to integrate modern digital technologies in the manufacturing sector (Bertola & Teunissen, 2018). Later on, other countries such as the USA, Japan, China, and some EU countries followed the footsteps of Germany and adopted I4.0 technologies (Hoque et al., 2021). As this term was coined in 2011, scholarly articles about this concept are available from 2016 (Arribas & Alfaro, 2018; Xu et al., 2018). However, I4.0-related research in the textile and apparel industry is still exploratory in nature. Some researchers conducted case studies to identify the drivers of I4.0, while others intended to identify the challenges and prospects of adopting I4.0-related technologies in the textile and apparel industry (Bertola & Teunissen, 2018; Sun & Zhao, 2017). Bertola and Teunissen (2018) suggested a model named Fashion 4.0 in correspondence with Industry 4.0. Through their model, the authors illustrated the potential implementation of artificial intelligence, the internet of things, augmented reality, smart robots, 3D printing, cloud computing, big data analytics, and other I4.0 elements in the textile and apparel industry (Bertola & Teunissen, 2018). The study by Sun and Zhao (2017) exclusively focused on the properties of the latest 3D printing to discourse the challenges and potentials in manufacturing apparel products. Some researchers (Chaw Hlaing et al., 2013; Lage & Ancutiene, 2017) inspected the use of augmented reality in designing prototypes in apparel manufacturing as well as in online apparel purchasing. The research work of Papahristou and Bilalis (2007) inspected how I4.0-related technologies can enable apparel firms to achieve sustainability-related goals in the textile and apparel industry.

Table 3 illustrates examples of technology adoption research in various contexts of apparel manufacturing and supply chain. Existing literature supports that sustainable technology adoption is less addressed by researchers in the fashion and apparel discipline. Some research questions, including "how the adoption of technology can help achieve sustainability-related goals," are less addressed in the published literature. Furthermore, previous researchers did not examine whether the workforce of the apparel industry is ready to adopt sustainable technologies. The following section discusses technology readiness, followed by a section discussing sustainable technology.

Table 3. Examples of Technology Adoption in Various Contexts Related to Apparel Manufacturing and Supply Chain

Technology	Context/Impact of Adoption	Example
Information Technology (IT)	Online business competency development	Ding et al. (2011)
	Internal communication and financial performance improvement	Andersen and Segars (2001)
	Enhancing products/services innovation, operation efficiency, customer service, and overall development of organizational capabilities	Jin (2006), Luo et al. (2012)
Computer-Aided Design (CAD)	Reducing the time for product development significantly and enhancing the efficiency	Hinds et al. (1992), Sayem et al. (2010)
	Lead-time reduction	Yan and Fiorito (2007)
	Faster response in apparel manufacturing operations	Tao and Bruniaux (2013)
	Replacing traditional design technique	Liu et al. (2010), Lu et al. (2017)
	Improving agility and product quality	Burke and Sinclair (2015)
	Virtual try-on technology in garment design	Liu et al. (2017), Tao et al. (2018)
Radiofrequency Identification (RFID)	Sustainability benefits (waste reduction, increased recycling, transparency/visibility of the supply chain)	Denuwara et al. (2019)
	Faster distribution, improved efficiency, faster response, and speedy logistics	Azevedo and Carvalho (2012)
	Substantial improvement in inventory management and product-flow visualization in the supply chain	Chan (2016)
	Collection of real-time data with an analytical feature for predicting behavior	Wong et al. (2014)
Industry 4.0	Potential implementation of artificial intelligence, the internet of things, augmented reality, smart robots, 3D	Bertola and Teunissen (2018)

	printing, cloud computing, big data analytics, and other I4.0 elements in the textile and apparel industry	
	Challenges and potentials of 3D printing in manufacturing apparel products	Sun and Zhao (2017)
	Use of augmented reality in designing prototypes in apparel manufacturing	Chaw Hlaing et al. (2013), Lage and Ancutiene (2017)
	Potentials of Industry 4.0-related technologies in achieving sustainability-related goals of the textile and apparel industry	Papahristou and Bilalis (2007)
	Factors affecting Blockchain adoption in the apparel supply chain	Nath et al. (2022)
	Internet of Things (IoT) in the textile and apparel industry	Hussain et al. (2022)
	Artificial intelligence in the apparel industry	Jayatilake and Withanaarachchi (2016)

Technology Readiness

Defining the Concept

Technology readiness can be regarded as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine the predisposition of a person to use novel technologies (Parasuraman, 2000). In the existing literature, technology readiness has been considered a factor that fosters or hinders new technology adoption. Several studies in the technology adoption literature used the technology readiness index (TRI) as the theoretical background (Qasem, 2021; Wang et al., 2017; Yi & Moon, 2021).

The seminal work of Parasuraman (2000) established the progress of technology readiness literature by theorizing the determinants of an individual's predisposition to accept and adopt new technologies. Technology readiness can be termed as people’s propensity to embrace and use new technologies to accomplish work and life goals. It can be regarded as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use novel technologies (Parasuraman, 2000). In the existing literature, technology readiness has been considered a concept that fosters or hinders new technology adoption (Jaafar et al., 2007; Lin & Chang, 2011). Technologies can trigger people's feelings of fun or anxiety, directly or indirectly impacting their beliefs and behavior towards those technologies. According to Parasuraman (2000), the different valence of feelings might co-exist in people's minds, and as a result, either positive or negative feelings towards technology will dominate each person. Parasuraman (2000) proposed four dimensions of technology readiness: optimism, innovativeness, discomfort, and insecurity. Parasuraman (2000) suggested that optimism and innovativeness can be considered the motivators of technology, whereas discomfort and insecurity are considered inhibitors.

Optimism refers to having a positive observation of technology, including an individual's beliefs of control, efficiency, convenience, and flexibility. Technology readiness, a multidimensional concept, includes both negative and positive aspects. Optimism was regarded as positive technology readiness by Parasuraman (2000), which can be referred to as the positive view of individuals on any specific technology that makes the individuals have higher trust, higher optimism, and higher evaluation of the new technology (Wang et al., 2017).

Innovativeness can be defined as an individual's tendency to be a technological leader or pioneer. A similar construct was proposed by Agarwal and Prasad (1998) named personal innovativeness in the context of information technology. They defined personal innovativeness as ''the willingness of an individual to try out any new information technology'' (p. 206). Innovativeness appeared to be the most frequently studied concept in the existing literature among the four dimensions of technology readiness.

Insecurity is defined as the consequence of a shortage of trust in any specific technology as well as the ability of the technology to work appropriately (Parasuraman, 2000). Previous research suggests that an individual's perceived lack of security contributes to the sluggish or slow adoption of any technology (Hoffman et al., 1999). According to Ram (1987), insecurity is also associated with the anticipated benefits of technology. Previous research suggests that the lower the expected benefits of technology, the higher the resistance to that technology (Ram, 1987). Insecurity is related to uncertainties or disbelief about the technology and distrust towards the capability of the technology.

Discomfort refers to the individual's perceived absence of control and a feeling of being overwhelmed by technology (Parasuraman, 2000). In other words, discomfort is an acknowledged shortage of control over technology by individuals and their sense of being overwhelmed by that technology. This dimension measures the extent to which people have a general prejudice against technology-based products. People who score high on the discomfort scale feel out of control and overwhelmed by technology. They tend to think technology is harder to use and more complicated (Walczuch et al., 2007).

Among these four factors, optimism and innovativeness drive or contribute to technological readiness, whereas discomfort and insecurity impede it. Technology readiness of an individual is explained by a combination of the inhibitors that inhibit the individual from adopting a specific technology and contributors that foster the individual to adopt and use that technology. Technology readiness denotes the overall attitude of an individual toward the new technology rather than his or her competencies to use the technology (Stanford et al., 2009). The central agreement of technology readiness research happens to be individual-specific rather than system or organization-specific (Celik & Kocaman, 2017).

Technology Readiness in Various Contexts

Existing literature shows that technology readiness has been investigated widely for different technologies and in various industries. The construction industry, hotel industry, travel industry, airline industry, m-commerce industry, financial service industry, iron, and steel industry, catering industry, label printing industry, small and medium enterprises, manufacturing and energy industry, retail industry, education, sports and fitness industry, insurance industry are the most common industries where technology readiness has been investigated for numerous types of technologies. Previous studies also examined technology readiness in the context of various types of technology, including sustainable technology, self-service technology, travel technology, virtual technology, information technology, artificial intelligence, Industry 4.0, e-learning technology, wearable sports technology, blockchain technology, and try-on technology. Table 4 summarizes some research articles on technology readiness in various contexts.

Table 4. Examples of Research on Technology Readiness in the Various Contexts

Industry	Technology Readiness Context	Example
Construction industry	General technology	Jaafar et al. (2007), Kuo (2013)
	Sustainable technology	Foroozanfar et al. (2017)
Hotel industry	Self-service technology	Pham et al. (2020)
Travel industry	Travel technology	Wang et al. (2017), Pradhan et al. (2018)
	Virtual technology	Yang et al. (2022)
Airline industry	Self-service technology	Liljander et al. (2006)
M-commerce industry	M-commerce	Roy and Moorthi (2017)
Financial service industry	Information technology	Walczuch et al. (2007)
Iron and steel industry	General technology	Klar et al. (2016)
Catering industry	Artificial intelligence	Gao et al. (2022)
Label printing industry	General technology	Reynolds et al. (2020)
Small and Medium Enterprises	Information technology	Spinelli et al. (2013)

	Industry 4.0	Khin and Mui Hung (2022)
Manufacturing and Energy industry	Green technology	Yali Zhang et al. (2020)
Retail industry	Self-scanning technology	Elliott et al. (2013)
Education	Virtual technology, E-learning technology	Yi and Moon (2021), El Alfy et al. (2017)
Sports and fitness industry	Wearable sports technology	Kim and Chiu (2019)
Insurance industry	Agent technology	Taylor et al. (2020)
Public sector	Information systems	Mahendrati and Mangundjaya (2020)
E-tail industry	Service technology	Mummalaneni et al. (2016)
Supply chain and Operations	Blockchain technology	Kamble et al. (2019)
Fashion and apparel industry	Try-on technology	Qasem (2021)
	Mobile shopping technology	Celik and Kocaman (2017)

Only minimal studies address technology readiness in the fashion retailing industry, but those studies did not focus on apparel firm managers' technology readiness. For example, Qasem (2021) conducted a quantitative study and examined the consumers' characteristics influencing the adoption of virtual try-on technology in e-fashion retailing. The study's findings showed that consumers' technology readiness significantly impacted the individual's behavioral intention.

Antecedents of Technology Readiness

Because technology readiness is seen as a stable, individual-level trait-like attribute, and is frequently included as an endogenous factor in technology adoption studies, research on its antecedents is limited (Parasuraman & Colby, 2015). Prior studies have mainly focused on two types of variables: demographics and prior experience, which may influence or correlate with technology readiness (Blut & Wang, 2020). Regarding demographics, according to Dutot (2014), age is negatively correlated with technology readiness, which means that younger and more educated people tend to use new technologies more frequently. However, these effects can occasionally be insignificant (Gilly et al., 2012), which may be related to the fact that people of all ages have become increasingly accustomed to technology over the past 20 years. Other researchers have focused on how experience affects technology readiness, finding that people's technology readiness increases with their level of technology-related experience. Thus, experience has a favorable relationship with technology readiness, especially with regard to its innovativeness dimension (Blut & Wang, 2020).

Apart from these demographic antecedents, few researchers intended to include other antecedents of technology readiness. Celik and Kocaman (2017) investigated the involvement of fashion consumers as an antecedent of technology readiness and found that involvement positively impacts technology readiness. Sun (2016) investigated Information and Communication Technology (ICT) adoption at the individual level and used user characteristics and technology experience as the antecedents of technology readiness. The study found that user characteristics and technology experience positively impact technology readiness. Purnomo et al. (2021) also found that individual characteristics positively impact technology readiness. Because findings in this area are limited and inconclusive, this dissertation considers personal characteristics (involvement and knowledge) as the antecedents of sustainable technology readiness. Table 5 summarizes the antecedents of technology readiness found in the previous research.

Table 5. The Antecedents of Technology Readiness in Previous Research

Previous Studies	**Antecedents of Technology Readiness**	**Findings (Impact on Technology Readiness)**	**Context**
Celik and Kocaman (2017)	*Involvement*	Positive Impact	Mobile shopping adoption
Yang et al. (2022)	*Flow Experience*	Positive Impact	Virtual tourism technology acceptance

Mahendrati and Mangundjaya (2020)	*Readiness for Change*	Positive Impact	Information technology adoption in the public sector
Khin and Mui Hung (2022)	*Financial Capabilities* *Technological Capabilities*	Positive Impact Positive Impact	Industry 4.0 adoption in SME
Rojas-Méndez et al. (2017)	*Gender* *Age* *Education* *Country Difference (Geographical Location; Developed or Developing Country)*	Positive Impact Negative Impact Positive Impact Positive Impact	Cross-cultural validation
Blut and Wang (2020)	*Age* *Education* *Experience*	Negative Impact Positive Impact Positive Impact	General Technology
Shirahada et al. (2019)	*Memory Self-efficacy* *Aging Satisfaction*	No Significant Impact Positive Impact	Online public services usage by elderly persons
(Purnomo et al., 2021)	*Owner's Characteristics (Knowledge)* *Innovation Characteristics (Innovation)* *Environmental Characteristics (Competition)*	Positive Impact Positive Impact Positive Impact	Technology adoption in Indonesian SMEs
Alsultanny and AlZuhair (2019)	*Age* *Nationality* *Education* *Experience*	No Significant Impact Positive Impact Only on Insecurity dimension No Significant Impact Positive Impact Only on Insecurity dimension	Technology adoption in Cement industries
Yali Zhang et al. (2020)	*Technology Capability* *Relative Advantage*	Positive Impact Positive Impact	Green innovation adoption
Susitha (2021)	*Perceived Usefulness* *Attitude towards technology* *Perceived Ease of Use* *Perceived Management Support* *Techno-Optimism*	Positive Impact Positive Impact Positive Impact Positive Impact Positive Impact	Adoption of Advanced Manufacturing Technology (AMT) on the apparel shop floor

Sun (2016)	*User Characteristics* *Experience with the Tool/Technology*	Positive Impact Positive Impact	ICT adoption at the individual level
Dutot (2014)	*Age*	Negative Impact	Adoption of social media
Gilly et al. (2012)	*Age* *Gender* *Education* *Income* *Curiosity*	No Significant Impact Negative Impact No Significant Impact No Significant Impact Positive Impact	Internet adoption by older consumers

In the existing literature, the investigation of technology readiness toward sustainable technology is limited. Foroozanfar et al. (2017) investigated the factors affecting construction managers' technology readiness toward sustainable construction technology. Zhang et al. (2020) investigated how ready the firms are to adopt sustainable innovations. They examined the impact of technology readiness on the green process, product, and managerial innovation. The following section covers the discussion of sustainable technology.

Sustainable Technology

Sustainable technology can be defined as "technology or services that have the potential to radically reduce natural resource use" (Heiskanen et al., 2005, p. 99). Sustainable technologies are primarily adopted to meet sustainability requirements, including reducing the use of natural resources (Klewitz & Hansen, 2014) and minimizing waste and greenhouse gas emissions (Koltun, 2010; Tenakwah et al., 2022). Sustainable technology helps us reduce our dependence on non-renewable resources of energy (Noppers et al., 2014; Tenakwah et al., 2022).

Sustainability-related technologies can be classified into four kinds: carbon dioxide and other greenhouse gas emission reduction technology, substitute technology of natural material and fuel, energy-efficient technology, and recycling technology (*UNEP - UN Environment*

Programme, 2022). According to Frondel et al. (2007), sustainable and clean technology decreases air and water pollution and reduces energy and material consumption, while energy-efficient technology focuses on energy saving. According to Kondratenko et al. (2017), sustainable technology requires efficient use of materials and energy and, as a result, minimizes the detrimental impact on the environment.

For example, technologies like RFID (Radio Frequency Identification) can greatly benefit the apparel industry and help meet sustainability requirements. These technologies can impact the industry's sustainability efforts in the environmental, social, and economic aspects. RFID enables the industry to ensure effective apparel manufacturing operations, including visibility, traceability, inventory management, production process, logistics process, and asset tracking. Moreover, RFID dramatically improved the accuracy, efficiency, and safety of the production process of fiber recycling. This technology can decrease the production processing time by roughly 12% (Nayak, 2019). In a case study by Nayak (2019), a denim production plant used RFID technology efficiently to track the problems and malfunctions that occurred on the production floor, resulting in reduced production processing time and decreased product loss by 50%. According to Berthon (2016), we can recycle only 75% of pre-consumer waste (for example, cutting-room waste). The technologies like RFID enable real-time information sharing and the tracing and tracking of raw materials and merchandise, consequently providing total visibility of the apparel value chain. The traceability and visibility of the goods and raw materials facilitate apparel firms in making more socially and environmentally informed decisions (Kumar et al., 2017; Liu et al., 2010). Furthermore, RFID can decrease the number of human errors from error-prone and labor-intensive operations in apparel manufacturing (Kumar et al., 2017; Tajima, 2007).

Reducing environmental effects is largely achieved by utilizing sustainable technologies at different levels of the product and manufacturing processes. According to Oliveira Neto et al. (2019), the denim apparel industry was able to increase production efficiency at a cheaper cost with less environmental effect when outdated rapier looms were replaced with cutting-edge air-jet weaving machines. Some water-saving technologies, and technologies that assist in reusing treated wastewater, help to protect the water resource and contribute to reducing the environmental impact (Kabir et al., 2019). Previous research found that high environmental performance was achieved by implementing the advanced technology available to reduce water, energy, and chemical emissions, wastes, and pollutants (Ozturk et al., 2016). In the garment washing, dying, and finishing processes, sustainable practices involve innovation in materials and processes, and adopting advanced machines and technology (Khan et al., 2013). By combining laser and ozone technologies with certified eco-friendly chemicals, producers, including Arvindo, Vintage Denim, and Denim International, have developed eco-friendly denim with roughly 12.5 percent less water and 67.5 percent less chemical use (Ozturk et al., 2016).

Utilization of automation technologies can dramatically increase productivity, lead time management, cost reduction, product quality, and wastage reduction (Nayak et al., 2015). Islam et al. (2013) examined the applicability of automation in apparel manufacturing and found competitive advantages in terms of waste minimization and resource optimization. In their study of fabric waste in the Bangladesh knit manufacturing sector, Rahman and Haque (2016) found that there was roughly 26.5 percent of waste produced at various phases, including 13.6 percent during cutting and 6.9 percent during panel checking. They indicated that process automation and CAD/CAM technology could help control waste more effectively. Sampling is the core of the product development process in apparel manufacturing, where chances to reduce environmental impact exist and may contribute to competitive gains if efficiently managed through the appropriate management and use of technologies like 3D modeling and virtual try-on technology (Grieco et al., 2017).

The Industry 4.0 concept has led to the development of numerous technologies and management techniques that can alter manufacturing procedures and enable a smart factory (Bertola & Teunissen, 2018). These technologies can also help manage the production and supply chain disruption due to the COVID-19 pandemic (Islam et al., 2021; Su et al., 2022c, 2022a). The COVID-19 crisis may encourage further adoption of digital transformation by opening up new avenues for research and innovation in well-established technologies such as laser cutting, robotics, 3D design, linear digital printing, and additive manufacturing. These technologies are becoming increasingly relevant to sustainability (Islam et al., 2021).

In summary, this study focuses on the technologies used in apparel manufacturing which help apparel firms achieve pollution reduction, less energy consumption, waste reduction, and better working conditions (Fu et al., 2018; Islam et al., 2021). These types of technologies are considered sustainability-related technology in this study (Fu et al., 2018; Hoque et al., 2022). The next section will discuss the theoretical framework and hypotheses development.

Theoretical Groundings

Theories Used in Technology Adoption Research

Many researchers have explored and examined the adoption of new technology using different theoretical frameworks in various contexts. The theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), the theory of planned behavior (TPB) (Ajzen, 1985, 1991), the technology acceptance model (TAM) (Davis, 1989), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), diffusion of innovation (DOI) (Rogers, 1995), technology, organization, and environment (TOE) framework (Tornatzky & Fleischer, 1990), and institutional theory (DiMaggio & Powell, 1991; Scott, 2005) are recurrently used to investigate, explore, understand, and explain the adoption of technology at varied dimensions. In the research area of technology adoption, these models and theories are the most cited research pieces and work as the theoretical basis for most of the existing research.

The theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and the theory of planned behavior (TPB) (Ajzen, 1985, 1991) were used by many researchers (Morris et al., 2005; Pavlou & Fygenson, 2006) to investigate the new technology adoption behavior. According to the theory of reasoned action, the most important determinant of behavior is behavioral intention which is determined by attitude and subjective norms. Ajzen (1991) recognized that many of the behaviors of an individual are subject to obstacles and control and thereby introduced the theory of planned behavior. The theory of planned behavior generalizes the theory of reasoned action by incorporating a third construct, perceived behavioral control. This seminal work from Ajzen (1991) offers a parsimonious but comprehensive theory that illustrates a causal structure to explain an extensive range of human behavior, including the adoption of new technology (Lynne et al., 1995; Morris et al., 2005; Pavlou & Fygenson, 2006; Shih & Fang, 2004).

Putting light on the limitation of the theory of reasoned action and the theory of planned behavior, the technology acceptance model (TAM) was established in the literature on information systems to examine technology adoption and use. Davis (1989) hypothesized the variables “perceived ease of use” and “perceived usefulness” as the fundamental determinants of technology acceptance at the personal level. The original model of Davis (1989) has been modified and extended several times by a number of researchers in different contexts and in the adoption of different technologies (Lee et al., 2003; Marangunić & Granić, 2015).

Several contending theories emerged towards the end of the twentieth century in order to address the limitations of the technology acceptance model (TAM) (Davis, 1989). Reviewing and analyzing existing technology acceptance models, Venkatesh et al. (2003) came up with an integrated effort. They reviewed and empirically compared eight existing models in order to formulate a single powerful theory, and they named it the "unified theory of acceptance and use of technology (UTAUT)." After formulating the model, the authors validated and showed that the unified model outperforms each of the existing eight models. This theory depicts four core factors (performance expectancy, effort expectancy, social influence, facilitating conditions) affecting the intention and use of technology and four moderators (gender, age, experience, voluntariness of use) impacting the relationships between the factors and intention and use (Venkatesh et al., 2003). This unified model has been extensively used and adapted by academicians and industry practitioners (Ahmad et al., 2013; Ferri et al., 2020; Patil et al., 2020). UTAUT proposes that facilitating conditions and social influence, together with performance expectancy and effort expectancy, impact behavioral intention, which in turn impacts actual behavior. In 2012, Venkatesh et al. (2012) proposed an extension of this model. They incorporated three additional constructs, hedonic motivation, habit, and price value, into the UTAUT model. This extension confirmed the critical roles of hedonic motivation, habit, and price value in affecting technology use in the context of consumer acceptance.

In addition, diffusion of innovation theory explains why, how, and at what rate new technologies and ideas might spread through cultures functioning at the individual as well as industry level. Diffusion of innovation theory perceives innovations as being within a particular social system and communicated across particular channels throughout time (Rogers, 1995). According to Rogers (1995), individuals possess the varying willingness to accept new ideas and innovations, which leads to the identification of individual innovativeness (innovators, early adopters, early majority, late majority, and laggards). This theory of innovation diffusion has been adapted and applied in various ways, including technology adoption in material requirement planning (Cooper & Zmud, 1990), enterprise resource planning (Bradford & Florin, 2003), e-business (Zhu et al., 2006), and so on. Ramayah et al. (2013) examined the determinants of technology adoption among Malaysian SMEs in light of innovation diffusion theory. They explained the findings of the study based on this theory. The study of Nath et al. (2022) investigated the factors affecting blockchain adoption in apparel supply chains using innovation diffusion theory as their theoretical background. While examining the innovation adoption rate, Rogers (1995) proposed that compatibility, relative advantage, complexity, observability, and trialability played a significant role in the process of innovation adoption decision. Moore and Benbasat (1996) adapted Rogers' (1995) work and supplemented some more constructs for examining technology acceptance by individuals and those are visibility, compatibility, relative advantage, ease of use, the voluntariness of use, image, and demonstrability of results.

Institutional theory is a collective theory that attempts to explicate the phenomena related to technology adoption in companies (Oliveira & Martins, 2010). This theory establishes the macro view of the organizational decision-driving factors, which clarifies that organizations are influenced and highly interfered with by the components of their institutional environment (DiMaggio & Powell, 1991; Scott, 2005). van Oorschot et al. (2018) argued that institutional theory is also a theoretical cornerstone of technology adoption research.

In the technology, organization, and environment (TOE) framework by Tornatzky and Fleischer (1990), three aspects of business context are identified through which the firms adopt and implement technology-related innovations. Those three contexts are technological context, organizational context, and environmental context. The internal and external technological infrastructure available to the organization is included in the technology dimension. The environmental context includes market characteristics like competitive factors. The organizational context includes relationships and procedures that exist within the company and are important for the adoption of new technologies, such as managerial support.

Freeman (1984) presented the idea of stakeholders as a tool for strategic management by stressing the distinctions between shareholders and stakeholders as well as the latter group's influence on the organization's decision-making process. Stakeholders may have a big impact on how organizations use their resources and increase value creation by taking factors like power, legitimacy, and urgency (Beck & Storopoli, 2021) into account. For this reason, engaging interactions between businesses and stakeholders are advised (Freeman et al., 2010) in order to develop sustainable strategic and competitive advantages (Islam et al., 2021). Some recent articles used stakeholder theory (Freeman, 1984) in explaining the technology adoption at the industry level (Hoque et al., 2022; Weng et al., 2015). According to stakeholder theory, stakeholders can significantly influence the allocations of resources by firms and increase the creation of value through consideration of attributes like urgency, power, and legitimacy. According to Freeman et al. (2010), firms and their stakeholders must maintain engaging relationships to create a sustainable strategy and competitive advantage.

Table 6 summarizes the primary theories that have been widely used in technology adoption research. Table 6 shows the factors and parameters influencing technology adoption in each theory. This table also shows the scope of the theories regarding the application at the industry or individual level. TRA, TPB, TAM, and UTAUT are formulated, used, and established to examine the technology-adoption-related behavior only at the individual level, not at the industry level (Tiago Oliveira & Martins, 2011). The most cited research works regarding industry-level technology adoption are the diffusion of innovation (DOI) by Rogers (1995), institutional theory (DiMaggio & Powell, 1991; Scott, 2005), and the technology, organization, and environment (TOE) framework by Tornatzky and Fleischer (1990).

Table 6. Theoretical Cornerstones in Technology Adoption Research

Theory and Models	Seminal Work	Description of the Theory	Level of Analysis	Example
Theory of Reasoned Action (TRA)	Fishbein and Ajzen (1975)	Human behavior prediction through cognitive components: (1) attitudes, (2) subjective norms, (3) behavioral intentions.	Individual Level	Mishra et al. (2014), Rehman et al. (2007)
Theory of Planned Behavior (TPB)	Ajzen (1985, 1991)	Human behavior prediction through cognitive components: attitude, subjective norm, and perceived behavioral control.	Individual Level	Morris et al. (2005), Pavlou and Fygenson (2006)
Technology Acceptance Model (TAM)	Davis (1989)	Five factors for technology adoption in the context of information technology: perceived usefulness, perceived ease of use, attitude toward using, behavioral intention to use, and actual use.	Individual Level	Chi (2018), Kamble et al. (2019)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Venkatesh et al. (2003)	Performance expectancy, effort expectancy, social influence, and facilitating conditions influence behavioral intention	Individual Level	Ahmad et al. (2013), Queiroz and Fosso Wamba (2019), Ferri et al. (2020)
Diffusion of Innovation (DOI)	Rogers (1995)	Four factors for measuring the rate of technology adoption: the innovation itself, communication channels, time, and social system. Five innovation parameters: compatibility, relative advantage,	Individual and Industry Level	Zhu et al. (2006), Bradford and Florin (2003)

		complexity, trialability, and observability.		
Institutional Theory	DiMaggio and Powell (1991); Scott (2005)	Technology adoption decisions go beyond rational considerations. The institutional theory identifies the necessity for legitimization as the central force driving organizational practices, such as the use of innovation. There are three kinds of institutional pressures that affect the adoption of technology: mimetic, coercive, normative.	Industry level	Soares et al. (2020), Zhang and Dhaliwal (2009)
Technology, Organization, and Environment Framework (TOE)	Tornatzky and Fleischer (1990)	Consists of three contexts (technological, organizational, and environmental) that influence the progression of organizations adopting and implementing technological inventions.	Industry Level	Norman and Alamsjah (2020), Iqbal and Su (2021), Caldarelli et al. (2021)
Technology Readiness Index (TRI)	Parasuraman (2000)	Four dimensions of technology readiness as optimism, innovativeness, discomfort, and insecurity	Individual and Industry Level	Yi and Moon (2021), Berlilana et al. (2021)
Stakeholder Theory	Freeman (1984)	Considering attributes like urgency, power, and legitimacy, stakeholders can significantly influence the allocations of resources by firms and increase the creation of value.	Industry Level	Hoque et al. (2022), Weng et al. (2015)

Existing technology adoption literature suggests that some studies utilized integrated theoretical foundations for understanding and explaining the findings. The study of Lou and Li (2017) investigated the adoption of blockchain technology by business managers in light of an integrated theoretical model that consisted of both innovation diffusion theory (DOI) and the technology acceptance model (TAM). The study of Kamble et al. (2019) examined a similar context and used an integrated model, including the technology acceptance model (TAM), theory of planned behavior (TPB), and technology readiness index (TRI) as a theoretical foundation. Nath et al. (2022) investigated the factors affecting the adoption intention of blockchain technology in the apparel supply chain and developed their integrated framework based on the technology organization environment (TOE) framework and diffusion of innovation (DOI) theory. Nazim et al. (2021) and Park (2020) have also utilized an integrated theoretical framework consisting of the unified theory of acceptance and use of technology (UTAUT) and the technology, organization, and environment (TOE) framework. In addition, Lin and Hsieh (2007) employed integrated theoretical grounding by combining the technology acceptance model (TAM) and technology readiness index (TRI) to investigate the influence of technology readiness on consumer satisfaction and behavioral intention toward self-service technology. Kim and Chiu (2019) also employed integrated theoretical grounding combining the technology acceptance model (TAM) and technology readiness index (TRI) in explaining the role of technology readiness in consumers' acceptance of sports wearable technology. Table 7 illustrates the integrated theoretical models in technology adoption research.

Table 7. Integrated Theoretical Models in Technology Adoption Research

Integrated Models	Example
TAM + DOI	Lou and Li (2017), Lee et al. (2011), Ullah et al. (2021)
TAM + TPB	Mathieson (1991)
DOI + TOE	Nath et al. (2022), Chong et al. (2009)
UTAUT + TOE	Nazim et al. (2021), Park (2020)
TAM + TRI + TPB	Kamble et al. (2019)
TAM + TRI	Lin and Hsieh (2007), Kim and Chiu (2019)

The Theoretical Framework of the Study

Technology adoption researchers demonstrated that a combination of theories for explaining innovative technology adoption increases the explanatory power of the research framework (Oliveira & Martins, 2011). This study is an individual-level study, and the purpose is to analyze the technology readiness and adoption intention of apparel firm managers toward sustainability-related technology. To achieve the purpose of this study, the diffusion of innovation theory (DOI), the unified theory of acceptance and use of technology (UTAUT), and the technology readiness index (TRI) were utilized in an integrated way to provide the theoretical grounding of the study.

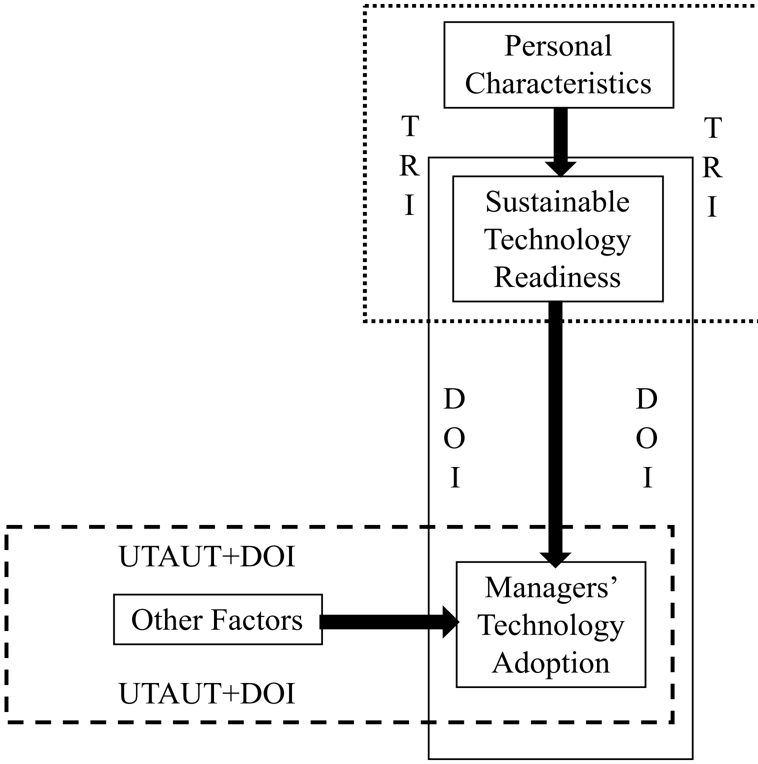
DOI indicates that an individual's innovativeness is a critical personal characteristic of people adopting technology. An individual's level of innovativeness depicts their attitude toward any change. This theory defines the procedure of technology propagation from the foundation of technological innovation to the end users of technology (Rogers, 1995). This theory helps examine some essential factors affecting the identification, acknowledgment, and adoption of technologies by individuals and organizations (Wejnert, 2002). According to Rogers (2005), furnished with the principles of diffusion, innovative technologies' success in propagation can be predicted (Maduku et al., 2016).

UTAUT has emerged as one of the most accepted theoretical lenses for understanding individuals' technology adoption (Ferri et al., 2020; Patil et al., 2020). The study by Nazim et al. (2021) utilized UTAUT to investigate the behavioral intention of bankers toward blockchain technology adoption in the Malaysian Islamic financial system. Queiroz and Fosso Wamba (2019) aimed to understand the individual's behavior toward blockchain adoption in the supply chain and logistics field in India and US using UTAUT. It is evident from the literature that sustainable technology adoption can be explained by the theoretical underpinnings of UTAUT (Park, 2020). Park (2020) explored the factors influencing blockchain adoption in the logistics industry and the findings suggested that UTAUT constructs exerted significant impacts on the intention toward sustainable usage of blockchain. Existing literature also suggests that UTAUT has the explaining power of technology adoption in the context of developing and emerging economy (Queiroz & Fosso Wamba, 2019; Wong et al., 2020). Therefore, it is found appropriate to engage UTAUT as one of the cornerstones of the integrated theoretical framework of this dissertation.

The impact of the personal characteristics (knowledge and involvement) of apparel firm managers on sustainable technology readiness can be explained by the technology readiness index (TRI) (Parasuraman, 2000). Existing literature supports that personal characteristics influence the technology readiness of the individual (Celik & Kocaman, 2017; Purnomo et al., 2021; Sun, 2016). The impact of apparel firm managers' sustainable technology readiness on their adoption intention toward sustainable technology will be explained in light of the diffusion of innovation theory. According to the diffusion of innovation theory, people show a wide degree of willingness to adopt technologies, and their willingness is associated with their attitude toward any change (Rogers, 1995). As technology readiness is conceptualized as an overall attitude of a person toward a technology (Stanford et al., 2009), DOI is found to be appropriate to explain the relationship between sustainable technology readiness and the adoption intention of managers working in apparel firms.

The influence of other factors, such as facilitating conditions, social influence, and relative advantage, on the adoption intention of the managers toward sustainable technology can be explained by the unified theory of acceptance and use of technology (UTAUT) and the diffusion of innovation theory. Specifically, the relationships of facilitating conditions and social influence with the adoption intention of the managers toward sustainable technology can be explained by the UTAUT because facilitating conditions and social influence are the two factors also used in UTAUT. On the other hand, Rogers (2003) found relative advantage played a significant role in the process of the innovation adoption decision, so the relationship between the relative advantage of sustainable technology and the adoption intention of the managers can be explained by the DOI. Figure 6 illustrates the theoretical background of this dissertation. The dotted line indicates the explanation of the relationship between personal characteristics and sustainable technology readiness, which is explained by TRI. The solid line indicates the explanation of the relationship between sustainable technology readiness and managers' technology adoption, which is explained by DOI. The dashed line indicates the explanation of the relationship between other factors (relative advantage, facilitating conditions, and social influence) and managers' technology adoption, which is explained by UTAUT+DOI.

Figure 6. Theoretical Framework

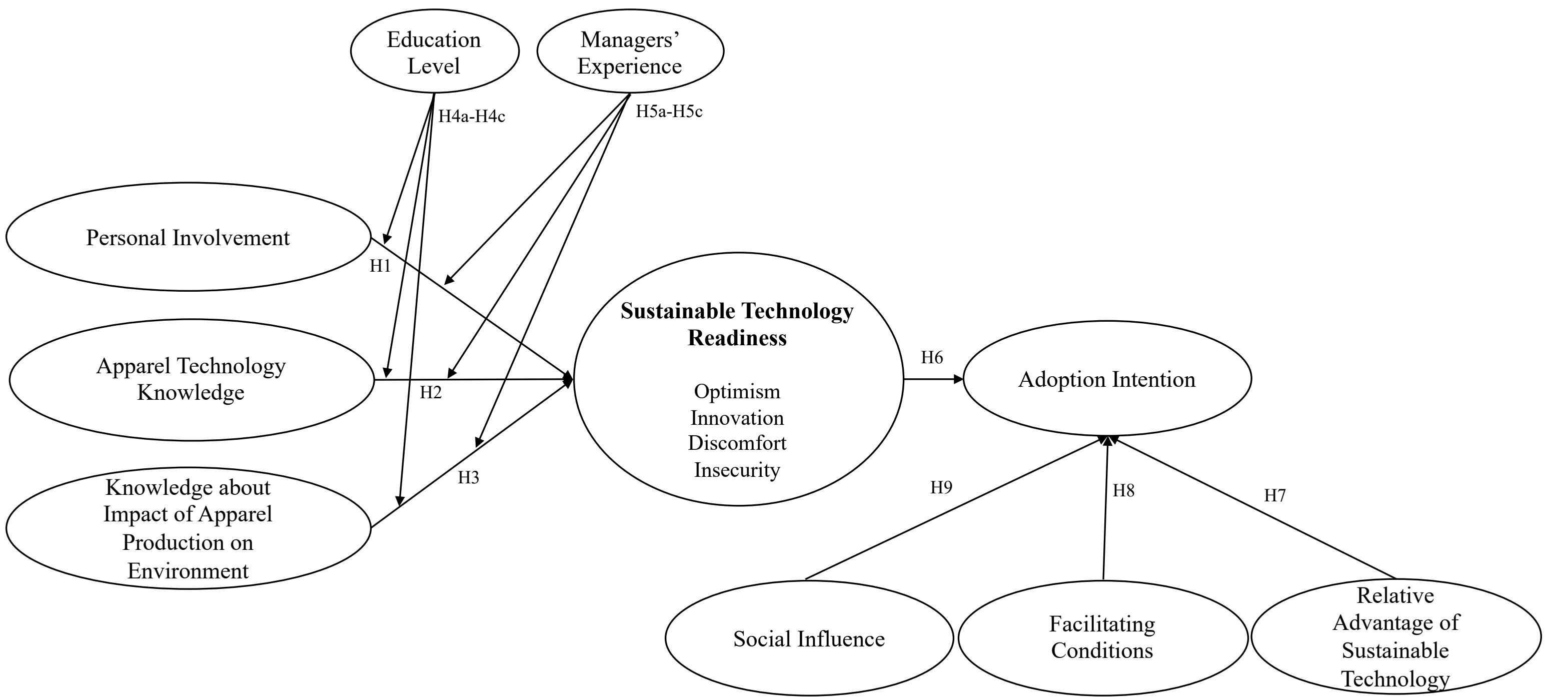


Note. Relationships explained by TRI are indicated within dotted lines. Relationships explained by DOI are indicated within solid lines. Relationships explained by UTAUT+DOI are indicated within dash lines.

Hypotheses Development

In this dissertation, there are six independent variables (personal involvement, apparel technology knowledge, knowledge about the impact of apparel production on the environment, social influence, facilitating condition, and relative advantage of sustainable technology), two moderator variables (education level, and managers' experience), and two dependent variables (sustainable technology readiness, adoption intention). The following discussion involves hypothesized relationships among the variables.

Figure 7. Theoretical Model and Hypotheses Development



Impact of Managers' Personal Involvement in Technology on Their Sustainable Technology Readiness

Personal involvement is the interest or the motivational state of stimulation of an individual towards objects as aroused by the desires, values, and needs, and the extent to which those objects are perceived as personally connected (O'Cass, 2004; Zhang & Kim, 2013). Individuals' involvement with technologies is a critical aspect of the diffusion of innovation in society. Individuals considered as highly involved in technological trends show positive attitudes toward technological products and services, which in turn provide them some social recognition (Rogers, 1983, 1995).

According to Rogers (1983), achieving and maintaining a social status is one of the primary motivations of individuals who adopt technological innovations earlier. Technology readiness is regarded as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine the predisposition of a person to use novel technologies (Parasuraman, 2000). As technology readiness has been considered as a factor that fosters or hinders new technology adoption, individuals' personal involvement with technology may influence their technology readiness (Agarwal & Prasad, 1998b; Parasuraman, 2000). The study by Celik and Kocaman (2017) investigated the relationship between fashion involvement and technology readiness in the context of mobile shopping. They found that consumers' fashion involvement significantly and positively influenced their technology readiness. Turan et al. (2015) proposed the involvement of technology users as an antecedent of behavioral intention using the UTAUT theory. According to Jarvenpaa and Ives (1991), the involvement of top managers is one of the significant predictors of the progressive use of information technology within the firm. So, the managers who show higher levels of involvement with technology have more interest in technology and possess more control over the technology (Latour et al., 2002). And these are the enablers of technology readiness as described by Parasuraman (2000). So, managers highly involved in technologies will value more sustainable technology and be more interested in and have more control over those technologies. Therefore, it was hypothesized that

H1: Apparel firm managers' personal involvement in technology positively affects their sustainable technology readiness.

Impact of Managers' Apparel Technology Knowledge on Their Sustainable Technology Readiness

Highly knowledgeable human resource positively impacts the adoption of sustainable technology (Blackman & Bannister, 1998; Cainelli et al., 2015; M. H. Weng & Lin, 2011). According to some recent studies conducted within the apparel industry context, knowledge about the latest apparel technology can be regarded as one of the important skills of apparel firm managers (Iqbal et al., 2022; B. Jacobs & Karpova, 2020). Knowledge of the latest technology helps individuals understand the impact of those technologies on manufacturing, business performance (Hodges & Link, 2017), and the environment (Kang et al., 2013). Managers who know about modern apparel manufacturing technologies and the benefits of using technologies in apparel firms will be more optimistic (Celik & Kocaman, 2017; Parasuraman, 2000; Qasem, 2021) about the technologies that help the firms in sustainable manufacturing (Koo & Chung, 2014; Wang et al., 2017). Furthermore, Brockman and Morgan (2003) found that knowledge impacts individuals' innovativeness. Rodan and Galunic (2004) also suggested that managers' knowledge significantly affects their innovativeness. As optimism and innovativeness are the core enabler dimension of technology readiness, the impact of technological knowledge on technology readiness is worth investigating. Moreover, managers who are less knowledgeable about the impact of existing technologies on apparel manufacturing will tend to show a higher level of distrust and insecurity (Kamble et al., 2019; Taylor et al., 2020) toward sustainability-related technology in apparel manufacturing. So, it was hypothesized that

H2: Apparel firm managers' apparel technology knowledge positively affects their sustainable technology readiness.

Impact of Managers' Knowledge about the Environmental Impact of Apparel Production on Their Sustainable Technology Readiness

Individuals' knowledge about the environmental impacts of manufacturing influences their environmental behavior and makes individuals more aware of the adverse impact of manufacturing on the environment (Ahmad et al., 2020). Amel et al. (2009) found that individuals who are more knowledgeable about environmental issues tend to show more sustainable behavior. Therefore, knowledgeable managers are more likely to concentrate on their surroundings and more likely to be aware of minimizing and controlling the environmental impacts of apparel manufacturing (Jenkin et al., 2011). For example, Simmons and Widmar (1990) advocated that a lack of knowledge about waste reduction can act as an obstacle to the environmental awareness of an individual, and this may happen even among people who feel responsible for the environment. Some previous studies also indicated that knowledge about unfavorable environmental consequences has a significant impact on environmentally friendly measures (Dalvi-Esfahani et al., 2017; Mayer et al., 2015). Individuals' environmental knowledge is associated with their understanding of the outcomes of their behaviors on the environment or on other individuals (De Groot & Steg, 2009). The knowledge of the environmental impacts of manufacturing can establish the belief that the existing conditions of the environment may be threatening to individuals' valuable things which can enhance the level of their optimism toward environmentally friendly tools and technologies (Asadi et al., 2021; Mishra et al., 2014). Thus, individuals who have more knowledge of undesirable outcomes of a manufacturing operation will be more likely to have a positive view toward sustainable technology. They tend to maintain a strong belief that technology provides them with increased flexibility, control, and efficiency (Parasuraman, 2000), enabling them to reduce undesirable environmental outcomes and gain better control over environmental impacts (Eriksson et al., 2006; Kang et al., 2013). As optimism is one of the significant dimensions of technology readiness, in the case of sustainable technology adoption, it may be proposed that apparel firm managers' higher knowledge of the environmental impacts of apparel manufacturing will increase their readiness toward sustainable technology (Tenakwah et al., 2022). The managers of the apparel firm who are highly knowledgeable about environmental impact may be active information seekers about new technology (Liébana-Cabanillas et al., 2018; Rogers, 1995). As active information seeking about technology is an indication of individual innovativeness (Liébana-Cabanillas et al., 2018; Rogers, 1995), individual apparel managers with a higher level of knowledge about environmental impact may show a higher level of innovativeness. Individuals' knowledge about environmental sustainability makes them believe that sustainable tools and technologies may reduce the environmental impact, ultimately reducing their discomfort and insecurity towards those technology (Parasuraman, 2000). When an apparel manager is knowledgeable about the environmental impact of apparel production, he/she may have less discomfort and insecurity regarding technologies that address sustainability in apparel manufacturing. So, it is worth investigating the direct impact of knowledge of the environmental impacts of apparel manufacturing on technology readiness. Therefore, in this study, it was hypothesized that, H3: Apparel firm managers' knowledge about the environmental impact of apparel production positively affects their sustainable technology readiness.

The Moderating Role of Managers' Education Level

Educational background can be referred to as the area of preceding education and the type of degrees accomplished (Chawla & Joshi, 2018). Educational accomplishments have been described as a substantial predictor of the adoption of technology and innovative practices. People who are less educated have been identified as having less sophisticated cognitive structures, which in turn confine and limit their ability to learn in a new environment (Hilgard & Bower, 1975). So, it is understandable that there is an association between education and knowledge (Chawla & Joshi, 2018). Previous research shows the influence of education level on individuals' involvement in technology products and their attitudes toward technology adoption in various contexts. According to Igbaria and Parasuraman (1989), the level of education is adversely associated with computer-related technology anxiety. Porter and Donthu (2006) found that there is a positive relationship between people's perceived ease of use of the internet and their level of education. The level of education was also used as a predictor in explaining the self-service technology adoption (Meuter et al., 2005). Rojas-Méndez et al. (2017) tested the cross-cultural validity of the technology readiness index (TRI). They found the level of education as one of the most consistent and significant predictors of technology readiness in all the cultures they investigated (Rojas-Méndez et al., 2017). Chawla and Joshi (2018) investigated the factors influencing the attitude of consumers to adopt online banking technology. Their study demonstrated that consumers' level of education serves as a moderating variable in the relationship between the predictors and their attitude toward online banking technology adoption (Chawla & Joshi, 2018). In line with the previous literature, this study hypothesizes that the level of education moderates the relationships between the characteristics of apparel managers (e.g., involvement in technology, their knowledge of apparel technology, and their knowledge about the environmental impact of apparel production) and their sustainable technology readiness. Thus, it was hypothesized in this study that

H4a: Apparel managers' education level moderates the relationship between their personal involvement and sustainable technology readiness.

H4b: Apparel managers' education level moderates the relationship between their apparel technology knowledge and sustainable technology readiness.

H4c: Apparel managers' education level moderates the relationship between their knowledge about the environmental impact of apparel production and sustainable technology readiness.

The Moderating Role of Managers' Experience

Fishbein and Ajzen (1975) suggested that the positive experience of individuals in the past with a given item will have a critical impact on their current behavior. Individuals having more experience with information technology tend to be more knowledgeable about the technologies and possess a favorable perception of the usefulness of those technologies (O'cass & Fenech, 2003). Some researchers found that individuals with prior experience with TV and the internet are more likely to purchase goods online (Dholakia & Uusitalo, 2002). Previous studies also suggest that the e-commerce adoption and adoption of mobile services are impacted by individuals' prior experience in using the internet (Kwak et al., 2002). So, it is understandable that experience is one of the factors influencing an individual's technology adoption directly or indirectly. In the existing literature on technology adoption, experience is conceptualized as more knowledge and familiarity with the technology of interest (H. Sun & Zhang, 2006). In this study, a similar conceptualization is accepted and assumed that the number of years of experience of an apparel firm manager in the apparel industry will resemble his/her knowledge and familiarity with the technology of interest. Chawla and Joshi (2018) investigated the factors influencing the attitude of consumers to adopt online banking technology and employed consumers' experience as a moderating variable. Tripathi (2018) found the moderating effect of managers' experience on the relationships between consumers' knowledge of the cost and benefits of cloud computing and their use of cloud computing. Therefore, in this dissertation, apparel managers' experience has been considered as a moderating variable that moderates the relationships between the knowledge and involvement of the managers and their technology readiness towards sustainable technology. It was hypothesized in this study that

H5a: Apparel managers' working experience moderates the relationship between their personal involvement in technology and sustainable technology readiness.

H5b: Apparel managers' working experience moderates the relationship between their apparel technology knowledge and sustainable technology readiness.

H5c: Apparel managers' working experience moderates the relationship between their knowledge about the environmental impact of apparel production and sustainable technology readiness.

Impact of Managers' Sustainable Technology Readiness on Their Intention to Adopt Sustainable Technology

Previous researchers indicated that individuals' technology readiness has a positive impact on their actual adoption behavior (Reynolds et al., 2020; Zeithaml et al., 2002). Zeithaml et al. (2002) proposed that consumers' e-shopping behavior is positively affected by their technology readiness. Reynolds et al. (2020) found that the technology readiness of the top management positively impacts technology adoption in small businesses. Pradhan et al. (2018) found a significant impact of technology readiness (optimism, innovativeness, discomfort, innovativeness) on the usage intentions of smart devices by travelers. Lin and Chang (2011) found technology readiness significantly impacts the adoption intention of self-service technology. Kamble et al. (2019) found technology readiness as a significant predictor of intention to use blockchain technology in the Indian supply chain context. Elliott et al. (2013) investigated the intention of consumers to use self-scanning technology and found that consumers' technology readiness plays a significant and positive role in influencing their intention to use self-scanning technology. Kim and Chiu (2019) examined consumers' acceptance of wearable sports technology and their findings showed that technology readiness significantly impacts the intention of consumers to use wearable sports technology. In the context of e-learning technology, El Alfy et al. (2017) found that individuals' attitudes toward e-learning technology, such as their optimism, innovativeness, discomfort, and insecurity, impact the behavioral intention of the people in Egypt and the United Arab Emirates. Verma and Chaurasia (2019) also found technology readiness as one of the determinants of intention to adopt big data in a firm. In the context of e-fashion retailing, Qasem (2021) found a significant effect of individuals' positive technology readiness (optimism and innovativeness) on their virtual try-on technology adoption. Therefore, in this study, it was hypothesized that

H6: Apparel managers' sustainable technology readiness positively affects their intention to adopt sustainable technology.

Impact of Managers' Perceived Relative Advantage of Sustainable Technology on Their Intention to Adopt Sustainable Technology

The relative advantage of a technology can be referred to as the benefits of the technology over other alternative technologies (Arts et al., 2011; Rogers, 1995). Relative advantage is the extent to which a technology is considered superior to the idea, product, or program it has replaced (Ullah et al., 2021). Relative advantage has been consistently used in the technology adoption literature especially when the researcher intended to explain the research findings in the light of the diffusion of innovation (DOI) theory (Chong et al., 2009; Nath et al., 2022; Ramayah et al., 2013; Rogers, 1995).

Previous studies reliably substantiated that there exists a positive relationship between technology adoption and relative advantage (Agarwal & Prasad., 1997; Chong et al., 2009; Ramayah et al., 2013; Tornatzky & Klein, 1982). Ramayah et al. (2013) investigated the factors influencing technology adoption in SMEs in the Malaysian context and found relative advantage as one of the significant factors. Chong et al. (2009) examined the determinants of collaborative commerce (c-commerce) at Malaysian electronics companies and their findings showed that relative advantage positively impacts c-commerce adoption. According to Ullah et al. (2021), relative advantage is also one of the significant determinants of the intention to use blockchain technology in the e-learning context. The study by Wong et al. (2020) examined the effects of relative advantage along with other factors on the adoption intention of blockchain technology for supply chain and operations management among SMEs. In the context of the apparel supply chain, Nath et al. (2022) investigated the factors influencing the adoption intention of blockchain technology. Their findings revealed that relative advantage has a significant and positive impact on the adoption intention of blockchain technology (Nath et al., 2022). When apparel managers perceive higher benefits of sustainable technologies than the existing ones in terms of reduction of waste and energy consumption, they may have a higher intention to adopt those technologies. Therefore, it was hypothesized that

H7: Apparel managers' perceived relative advantage positively affects their intention to adopt sustainable technology.

Impact of Facilitating Conditions on the Managers' Intention to Adopt Sustainable Technology

Facilitating conditions can be referred to as individuals' belief in the support and resources available to them for accomplishing a behavior (Dwivedi et al., 2007; Venkatesh et al., 2012). This denotes that if the managers get the opportunity to utilize the existing operational infrastructure and if the operational infrastructure facilitates them to use sustainable technology, their adoption intention of sustainable technology will increase (Oliveira et al., 2016). It is the setting where the apparel managers find that there exist accessible infrastructures intended to support the use of the technology within the firm (Nazim et al., 2021). Nazim et al. (2021) conducted a study to investigate the behavioral intention of Malaysian bankers to adopt blockchain technology. They used an integrated theoretical framework combining UTAUT and TOE and their findings showed that facilitating conditions were one of the significant determinants of the adoption intention of blockchain technology. Some other researchers also confirmed the significant effect of facilitating conditions on the adoption intention of blockchain technology in different contexts, such as supply chain and logistics (Park, 2020; Queiroz & Fosso Wamba, 2019), operations management (Queiroz et al., 2021), and production and procurement (Alazab et al., 2021). In the context of sustainability, Park (2020) found that facilitating conditions impacted managers' intention to use blockchain technology to meet sustainability-related goals. In this dissertation, when apparel managers get the resources and support necessary to use sustainable technologies in apparel manufacturing, they may be more interested in those technologies and show a positive intention to adopt them. Therefore, it was hypothesized that

H8: Apparel managers' perceived facilitating conditions positively affect their intention to adopt sustainable technology.

Impact of Social Influence on Managers' Intention to Adopt Sustainable Technology

Social influence refers to the degree to which individuals perceive that other people who are important in their lives think that they should adopt and use a particular technology (Baishya & Samalia, 2020; Venkatesh et al., 2012). For example, family members, peers, and colleagues may influence technology adoption significantly (Queiroz et al., 2021). In this dissertation, the construct "social influence" is referred to as the extent to which an individual apparel manager perceives that other apparel professionals who are important to them think that they should adopt or use sustainable technology in apparel manufacturing. The preference for technology acceptance is highly impacted by the social recognition offered by the close reference group. The managers of apparel firms can prefer being involved with technologies in order to accept any recognition from peers and close reference groups. At the individual level, prior research highlighted that intention is impacted by the acts and opinions of friends, family members, and colleagues (Irani et al., 2009; Venkatesh & Brown, 2001). Some recent research studies (Alazab et al., 2021; Nuryyev et al., 2020) have also shown how important social influence has become in technology adoption. Such as, social influence plays a significant role in internet-based banking adoption (Martins et al., 2014; Zhang et al., 2018) and the adoption of mobile government services (Ahmad & Khalid, 2017). Ferri et al. (2020) examined the factors that motivate auditors of large accountancy firms in Italy to use disruptive technology using the UTAUT framework. They found that social influence significantly affects the auditors' intention to use disruption technology. Using an integrated theoretical framework combining UTAUT and TOE, Nazim et al. (2021) showed that social influence was one of the significant determinants of the adoption intention of blockchain technology. In addition, Queiroz and Fosso Wamba (2019), Park (2020), and Queiroz et al. (2021) found the significant role of social influence affecting the adoption intention of blockchain adoption. Especially the study of Park (2020), which is similar to the study of Nazim et al. (2021), investigated the usage intention of sustainable blockchain technology and found that social influence exerted a significant impact on the intention of managers' sustainable usage (using the technology in a way that addresses sustainability requirements) of blockchain technology. So, apparel managers whose social influence is higher may possess a higher level of adoption intention toward sustainable technology. Therefore, it was hypothesized that

H9: Apparel managers' perceived social influence positively affects their intention to adopt sustainable technology.

Summary

This chapter reviews the literature pertinent to the apparel Industry of Bangladesh, sustainability in the global apparel supply chain, technology adoption in the apparel industry, technology readiness, and sustainable technology. After reviewing the relevant literature, the chapter provides the study's theoretical background and proposes a model. The chapter also describes the hypotheses development for the proposed model. The next chapter explains the methodology of this dissertation.

CHAPTER III: METHODOLOGY

As previously stated, the three main research objectives of this dissertation were:

1. To investigate the relationships between the knowledge and involvement of the managers and their readiness toward sustainable technology.
2. To examine the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness.
3. To investigate how apparel managers' sustainable technology readiness, their perceptions of social influence, facilitating conditions, and relative advantage of sustainable technology impact their intention to adopt sustainable technology.

This chapter describes the methodology involved in this quantitative study. The chapter is divided into the following sections: (1) Instrument Development, (2) Sample and Procedures, (3) Pilot Study and Data Collection Process, (4) Data Analysis Plan, and (5) Summary.

Instrument Development

Questionnaire Design

A survey was conducted to collect data and achieve the objectives of this dissertation. Surveys are the common and popular methods used in technology adoption research (Krosnick, 1999; Lavrakas, 2008) because surveys can provide valid responses (Blair et al., 2013; R. Groves et al., 2009) that can be generalized to other similar populations (Fowler Jr, 2013). Furthermore, surveys can offer impartial ways of comparing responses over different times, groups, and spaces (Fowler Jr, 2013; Lavrakas, 2008; Newsted et al., 1998).

The survey questionnaire had three sections:

(1) Introduction of the research background.

This section included a brief background of the research and the objectives of the research. This part helped the respondents to understand the background of the research and prepared them to assess their own perceptions and behaviors.

(2) Managers' demographic characteristics.

This part included the demographic characteristics of the respondents, including the type of the firm, size of the firm, what types of apparel products they manufacture, designation and work responsibilities of the manager, education, and years of experience.

(3) Questions related to the constructs.

The major sections of the questionnaire contained questions measuring the constructs in the conceptual model.

Measures

In this study, the data regarding the constructs were collected using a five-point Likert scale (for example, 1=strongly disagree, 2=inclined to disagree, 3=neither agree nor disagree, 4=inclined to agree, and 5=strongly agree) for each item. The Likert Scale is the most widely used and most effective tool for scaling responses in survey-type studies (Daniel, 2011; G. Norman, 2010). It is an ordered, one-dimensional scale from which respondents choose one option that best aligns with their views. This scale allowed respondents to indicate a degree of agreement/disagreement with the statement (Aaker et al., 2008). The questionnaire was developed using online survey software named 'Qualtrics.' The survey items used to measure the constructs in this study were adapted through an extensive literature review.

Personal Involvement

Personal involvement can be defined as the interest or the motivational state of stimulation of an individual towards objects as aroused by the desires, values, and needs, and the extent to which those objects are perceived as personally connected (O'Cass, 2004; Zhang & Kim, 2013). Involvement was initially conceptualized as "perceived relevance" rather than a behavioral use measure (Latour et al., 2002). Richins and Bloch (1986) explained involvement with technology as a temporal context representing a daily level of interest or arousal for a particular product. This study measured apparel firm managers' involvement with technology. Individuals' involvement with technologies is a critical aspect of the diffusion of innovation in society.

The scale to measure Personal Involvement was adapted from Celik and Kocaman (2017) and Jarvenpaa and Ives (1991) and consisted of four items (e.g., "I often get personally involved in matters related to the use of sustainable technology within the firm," and "I would like to gather information about what newer sustainable technologies are introduced by our competitors"). Both Jarvenpaa and Ives (1991) ($\alpha > 0.75$) and Celik and Kocaman (2017) ($\alpha > 0.88$) reported acceptable reliability of the scale.

Apparel Technology Knowledge

As discussed in Chapter II, knowledgeable human resource positively impacts the adoption of sustainable technology (Blackman & Bannister, 1998; Cainelli et al., 2015; M. H. Weng & Lin, 2011). Knowledge of the most recent apparel technology can be regarded as one of the critical capabilities of apparel managers, according to several recent research conducted in the context of the apparel industry (Iqbal et al., 2022; Jacobs & Karpova, 2020).

The five items to measure the construct Apparel Technology Knowledge were adapted from Dickson (2000) and Koo and Chung (2014) (e.g., "I know about modern apparel manufacturing technologies," "I am knowledgeable about the benefits of the use of modern technologies in apparel firms," and "I believe I am informed about the technologies that are being used by my firm"). The scale was initially developed by Dickson (2000). Koo and Chung (2014) reported acceptable reliability of the scale ($\alpha > 0.74$).

Knowledge about the Impact of Apparel Production on the Environment

As discussed earlier, individuals' environmental behavior is influenced by their knowledge of the adverse effects of manufacturing on the environment, which also increases awareness of these effects (Ahmad et al., 2020). According to Amel et al. (2009), people with greater environmental awareness typically behave more sustainably. As a result, knowledgeable managers are more likely to pay attention to their surroundings and be aware of how to minimize and regulate the environmental effects of the apparel production process (Jenkin et al., 2011). This dissertation measured the knowledge level of apparel managers about the environmental impact of apparel manufacturing.

The scale to measure the construct Knowledge about the Impact of Apparel Production on the Environment was adapted from Ahmad et al. (2020), Dickson (2000), and Kang et al. (2013) and consisted of six items (e.g., "I believe that I am informed about the environmental consequences of apparel production," "I am knowledgeable about the environmentally responsible apparel business," and "I know the impact of chemicals used in apparel production on the environment"). The scale was initially developed by Dickson (2000). Later, both Ahmad et al. (2020) and Kang et al. (2013) reported acceptable reliability of the scale ($\alpha > 0.91$).

Sustainable Technology Readiness

Technology readiness can be regarded as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine the predisposition of a person to use novel technologies (Parasuraman, 2000). In the existing literature, technology readiness has been considered a factor that fosters or hinders new technology adoption. Parasuraman (2000) proposed four dimensions of technology readiness as optimism, innovativeness, discomfort, and insecurity. Optimism refers to having a positive observation of technology, including individuals' beliefs about control, efficiency, convenience, and flexibility (Parasuraman, 2000). Innovativeness can be defined as an individual's tendency to be a technological leader or pioneer (Parasuraman, 2000). Insecurity is defined as the consequence of a shortage of trust in any specific technology as well as the ability of the technology to work appropriately (Parasuraman, 2000). Discomfort refers to the individual's perceived absence of control and a feeling of being overwhelmed by technology (Parasuraman, 2000).

Parasuraman (2000) first came up with a scale to measure four dimensions of technology readiness. Later, Parasuraman and Colby (2015) refined the scale. In this study, the four constructs, Optimism, Innovativeness, Discomfort, and Insecurity, were measured by the scales adapted from Parasuraman (2000) and Parasuraman and Colby (2015). The construct Optimism was measured by six items (e.g., "Sustainable technology makes you more efficient in your occupation" and "Learning about sustainable technology can be as rewarding as the technology itself"). The construct Innovativeness was measured by five items (e.g., "Other people come to me for advice on sustainable technologies" and "In general, I am among the first in your circle of friends to acquire new sustainable technology when it appears"). The scale measuring the construct Discomfort had six items (e.g., "Sometimes, I think that sustainable technology systems are not designed for use by ordinary people" and "There is no such thing as a manual for a sustainable high-tech machine that's written in plain language"). The scale measuring the construct Insecurity consisted of four items (e.g., "Too much technology distracts people to a point that is harmful," and "It can be risky to switch to a revolutionary new sustainable technology too quickly"). Parasuraman and Colby (2015) reported the reliability of Optimism, Innovativeness, Discomfort, and Insecurity as $\alpha > 0.86$, $\alpha > 0.77$, $\alpha > 0.77$, and $\alpha > 0.77$, respectively. In this study, the construct Sustainable Technology Readiness was measured by the averages of the items pertaining to each dimension as operationalized by previous studies (Goutam et al., 2022; Jaafar et al., 2007; Liljander et al., 2006; Lin & Chang, 2011; Mahendrati & Mangundjaya, 2020; Musyaffi et al., 2021).

Relative Advantage of Sustainable Technology

As discussed in Chapter II, the relative advantage of technology can be referred to as the benefits of the technology over other alternative technologies (Arts et al., 2011; Rogers, 1995). The relative advantage of a technology measures how much it is regarded as being superior to the technologies it has replaced (Ullah et al., 2021). Relative advantage has been consistently used in the technology adoption literature especially when the researchers intended to explain the research findings in the light of the diffusion of innovation (DOI) theory (Chong et al., 2009; Nath et al., 2022; Ramayah et al., 2013; Rogers, 1995).

The scale to measure the construct Relative Advantage of Sustainable Technology was adapted from Martins et al. (2016), Nath et al. (2022), and Verma and Chaurasia (2019). It consists of seven items (e.g., "Sustainable technology will provide new opportunities in waste minimization" and "Sustainable technology will provide new opportunities in energy consumption"). Martins et al. (2016) ($\alpha > 0.94$), Nath et al. (2022) ($\alpha > 0.91$), and Verma and Chaurasia (2019) ($\alpha > 0.82$) reported acceptable reliability of the scale.

Facilitating Conditions

Facilitating conditions are individuals' belief in the support and resources available to them for accomplishing a behavior (Dwivedi et al., 2007; Venkatesh et al., 2012). If the managers get the opportunity to utilize the existing operational infrastructure and if the operational infrastructure facilitates them to use sustainable technology, their adoption intention of sustainable technology will increase (Oliveira et al., 2016). It is the setting where the apparel managers find that there exists accessible infrastructure intended to support the use of technology within the firm (Nazim et al., 2021).

The scale to measure the construct Facilitating Conditions was adapted from Queiroz et al. (2021), Venkatesh et al. (2003), and Venkatesh et al. (2012). It consisted of five items (e.g., "I have the necessary resources to use sustainable technology" and "I can get help from others when I have difficulties using sustainable technology"). Queiroz et al. (2021), Venkatesh et al. (2003), and Venkatesh et al. (2012) reported acceptable reliability of the scale ($\alpha > 0.86$, $\alpha > 0.88$, and $\alpha > 0.75$, respectively).

Social Influence

As discussed earlier, social influence refers to the degree to which individuals perceive that other people who are important in their lives think that they should adopt and use a particular technology (Baishya & Samalia, 2020; Venkatesh et al., 2012). For example, family members, peers, and colleagues may influence technology adoption significantly (Queiroz et al., 2021). In this dissertation, the construct "Social Influence" is referred to as the extent to which an individual apparel manager perceives that other apparel professionals who are important to them think that they should adopt or use sustainable technology in apparel manufacturing.

The scale to measure the construct Social Influence was adapted from Venkatesh et al. (2003) and Venkatesh et al. (2012). It consisted of four items (e.g., “People who are important to me think that I should use sustainable technology” and “People who influence my behavior think that I should use sustainable technology.”). Both Venkatesh et al. (2003) and Venkatesh et al. (2012) reported acceptable reliability of the scale ($\alpha > 0.92$ and $\alpha > 0.82$, respectively).

Adoption Intention

Adoption intention represents the extent of an individual’s willingness and effort to adopt a technology. Researchers argue that intention could capture various motivational factors influencing an individual to perform a behavior. Therefore, the stronger the intentions of the individual, the higher the chances of performing the underlying behavior (Icek. Ajzen, 1985). In this study, adoption intention was conceptualized as apparel managers’ willingness to adopt sustainable technology in apparel firms.

The scale to measure the construct Adoption Intention was adapted from Patil et al. (2020), Queiroz et al. (2021), Venkatesh et al. (2003), and Venkatesh et al. (2012). It consisted of five items (e.g., “I intend to use sustainable technology in the future” and “I predict I would use sustainable technology in the future”). Patil et al. (2020), Queiroz et al. (2021), Venkatesh et al. (2003) and Venkatesh et al. (2012) all reported acceptable reliability of the scale ($\alpha > 0.88$, $\alpha > 0.96$, $\alpha > 0.90$, and $\alpha > 0.93$, respectively). Table 8 summarizes the scale items for each construct and their sources.

Table 8. Scale Items Used to Measure the Constructs

Construct	Conceptualization	Item Description	Source
Personal Involvement (4 items)	The interest or the motivational state of stimulation of an individual towards objects as aroused by the desires, values, and needs, and the extent to which those objects are perceived as personally connected (O'Cass, 2004; Zhang & Kim, 2013).	▪ I often get personally involved in matters related to the use of sustainable technology within the firm. ▪ I would like to gather information about what newer sustainable technologies are introduced by our competitors. ▪ I like to gather information about the current trend in the use of sustainable technologies in apparel firms. ▪ As a manager, I am involved in making suggestions or decisions regarding sustainable technology within the firm.	Celik and Kocaman, (2017), Jarvenpaa and Ives (1991)
Apparel Technology Knowledge (5 items)	The knowledge level of apparel firm managers about apparel manufacturing technologies.	▪ I know about modern apparel manufacturing technologies. ▪ I am knowledgeable about the benefits of the use of modern technologies in apparel firms. ▪ I believe I am informed about the technologies that are being used by my firm. ▪ I frequently read news and articles to learn about the technologies used in the apparel industry. ▪ I am knowledgeable about the impacts of technologies on apparel manufacturing.	Dickson (2000), Koo and Chung (2014)
Knowledge about the Impact of Apparel Production on the Environment (6 items)	The knowledge level of apparel firm managers about the impact of apparel production on the environment.	▪ I believe that I am informed about the environmental consequences of apparel production. ▪ I am knowledgeable about the environmentally responsible apparel business. ▪ I know the impact of chemicals used in apparel production on the environment. ▪ In general, I believe I am sufficiently aware of the environmental issues caused by apparel manufacturing. ▪ I believe I am sufficiently aware of the waste generated by apparel firms.	Ahmad et al. (2020), Dickson (2000), Kang et al. (2013)

		▪ I frequently read news and articles to learn about the environmental issues of the apparel business.	
Sustainable Technology Readiness (21 items)	An overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine the predisposition of a person to use novel technologies (Parasuraman, 2000). Sustainable technology readiness means the readiness of apparel firm managers towards sustainable technology in the apparel industry.	***Optimism*** ▪ Sustainable technology gives people more control over their daily lives. ▪ Products and services that use the newest sustainable technologies are much more convenient to use. ▪ I prefer to use the most advanced sustainable technology available. ▪ Sustainable technology makes you more efficient in your occupation. ▪ Learning about sustainable technology can be as rewarding as the technology itself. ▪ Sustainable technology makes me more productive in my personal life. ***Innovativeness*** ▪ Other people come to me for advice on sustainable technologies. ▪ In general, I am among the first in your circle of friends to acquire new sustainable technology when it appears. ▪ I keep up with the latest and sustainable technological developments in my areas of interest. ▪ I find I have fewer problems than other people in making sustainable technology work for me. ▪ I can usually figure out new and sustainable high-tech products and services without help from others. ***Discomfort*** ▪ Sometimes, I think that sustainable technology systems are not designed for use by ordinary people. ▪ There is no such thing as a manual for a sustainable high-tech machine that’s written in plain language. ▪ If I buy a high-tech product or service, I prefer to have the basic model over one with a lot of extra features. ▪ New sustainable technology makes it too easy for governments and companies to spy on people.	Parasuraman (2000), Parasuraman and Colby (2015)

		▪ Sustainable technology always seems to fail at the worst possible time. ▪ When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do. ***Insecurity*** ▪ Whenever something gets automated, I need to check carefully that the system is not making mistakes. ▪ People are too dependent on technology to do things for them. ▪ Too much technology distracts people to a point that is harmful. ▪ It can be risky to switch to a revolutionary new sustainable technology too quickly.	
Relative Advantage of Sustainable Technology (7 items)	The benefits of the technology over other alternative technologies (Arts et al., 2011; Rogers, 1995). The relative advantage of sustainable technology measures how much it is regarded as being superior to the technologies it has replaced (Ullah et al., 2021).	▪ Sustainable technology will provide new opportunities in apparel manufacturing. ▪ Sustainable technology will allow us to accomplish specific manufacturing tasks more quickly. ▪ Sustainable technology will allow us to enhance our productivity. ▪ Sustainable technology will allow us to save time in production. ▪ Sustainable technology could reduce business operational costs by automating the process. ▪ Sustainable technology will provide new opportunities for waste minimization. ▪ Sustainable technology will provide new opportunities in energy consumption.	Martins et al. (2016), Nath et al. (2022), Verma and Chaurasia (2019)
Facilitating Conditions (5 items)	Individuals' belief in the support and resources available to them for accomplishing the adoption of sustainable technology (Dwivedi et al.,	▪ I have the necessary resources to use sustainable technology. ▪ I have the knowledge necessary to use sustainable technology. ▪ I can get help from others when I have difficulties using sustainable technology.	Queiroz et al. (2021), Venkatesh et al. (2003, 2012)

	2007; Venkatesh et al., 2012).	▪ Specialized instructions concerning the use of sustainable technology are available to me. ▪ Sustainable technology is compatible with other technologies I use.	
Social Influence (4 items)	The extent to which an individual apparel firm manager perceives that other apparel professionals who are important to them think that they should adopt or use sustainable technology in apparel manufacturing.	▪ People who are important to me think that I should use sustainable technology. ▪ People who influence my behavior think that I should use sustainable technology. ▪ People whose opinions I value prefer that I use sustainable technology. ▪ The senior management of my company is helpful in the use of sustainable technology.	Venkatesh et al. (2003, 2012)
Adoption Intention (5 items)	Apparel firm managers' willingness and effort to adopt sustainable technology in apparel firms.	▪ I intend to use sustainable technology in the future. ▪ I predict I would use sustainable technology in the future. ▪ I will always try to use sustainable technology in my daily life at work. ▪ I plan to use sustainable technology frequently. ▪ I will recommend others to use sustainable technology.	Patil et al. (2020), Queiroz et al. (2021), Venkatesh et al. (2003, 2012)

Sample and Data Collection Process

Sample

This is an individual-level study focusing on apparel managers' perceptions of sustainable technology. According to Daniel (2011), "A sampling frame is a listing of the target population. It may be a list frame (e.g., a listing of names, telephone numbers, addresses, time periods, or events), an area frame (e.g., a map or a diagram), or a physical manifestation of the target population" (p. 79). The target population of this study was the managers of export-oriented apparel firms in Bangladesh and a convenience sample was used for this study. The reason behind selecting only managers from export-oriented apparel firms as the respondents was two-fold. First, export-oriented firms are doing business with large global brands. As a result, they are aware of the end consumers' attitudes toward sustainable manufacturing. They are also committed to sustainability and compliance in the apparel industry because they cannot export products without meeting those requirements. Second, this ensured the homogeneity of the sample.

After getting the Institutional Review Board (IRB) approval, the sample data were collected from Bangladeshi export-oriented apparel firms. In Bangladesh, all apparel firms are privately owned. Addresses, contacts, and e-mails were compiled from the members' directory of BGMEA (Bangladesh Garment Manufacturers and Exporters Association). The directory of ITET (Institution of Textile Engineers and Technologists) was also utilized for personal contacts of apparel firm managers. Managers of apparel firms were the target respondents for the survey as the purpose of this study was to investigate managers' readiness and adoption intention of sustainable technology. Furthermore, they were in the appropriate positions to provide accurate and valid responses to the survey questions. Presently BGMEA has around 4500 member factories. The directory of BGMEA is not updated regularly, and it seems the actual number of 100% export-oriented factories is less than 4500. There are two types of firms (knitwear and sweater, and woven). Around 40% of the member factories are knitwear and sweater manufacturers, and the rest of the 60% are woven garment manufacturers (BGMEA, 2022). This study randomly selected managers from different firms where there was a good mix of managers from both types of firms. The managers who responded to the survey had a minimum experience of two years working in the industry. Managers with positions ranging from assistant manager through assistant general manager/general manager to CEO/director/executive director/managing director were able to respond to this survey.

Sample Coverage Issues

Over-coverage means the elements that are not members of the target population may be included in the frame. On the other hand, some members of the target population may not be included in the frame, which we can call under coverage (Daniel, 2011). In the context of this study, there are some possibilities of over-coverage. Some firms may have stopped exporting and selling apparel products in the local market (due to COVID-19 or other issues), but still, managers from these firms may respond to the survey. Another kind of over-coverage may happen when someone who responds to the survey is not a manager or does not have at least two years of experience in the industry. To avoid this over-coverage situation, the survey recruitment letter explicitly explained the requirements for responding to the survey. Moreover, the survey included screening questions to ensure the respondents were from export-oriented apparel firms and had at least two years of experience in the apparel industry. The under-coverage situation might happen when some export-oriented apparel firms are not on the list of BGMEA. The chance of this situation was small because no factory could export apparel products from Bangladesh without being certified by BGMEA.

Pilot Study and Data Collection

To ensure the quality of the survey, the questionnaire went through two-step checking to assess the clarity of the questionnaire, including question content, sequence, form, and layout. First, the instruments, along with the scale items, were sent to two academic researchers who have previous experience in conducting research related to the apparel industry. After getting feedback from the academic researchers, the instruments were revised according to the feedback. Then the questionnaire was sent to four apparel firm managers, and the questionnaire was revised accordingly based on the feedback from the apparel managers.

After expert evaluation of the questionnaire, the IRB application was submitted. Upon receiving the IRB approval, a pilot survey was conducted. The purpose of the pilot study was to ensure whether the instruments were measuring what they were supposed to measure. In the pilot survey, the researcher used his personal connections in the apparel industry in Bangladesh, and 51 managers were requested to respond to the survey. Among them, 41 managers responded to the survey. Based on the evaluation of the pilot data collected, further adjustments were made to the questionnaire.

The finalized questionnaire in the English language was sent to the targeted respondents. The questionnaire was distributed through email and other social media platforms, including Facebook and WhatsApp. There are some Facebook Messenger and WhatsApp groups of apparel professionals in Bangladesh where I am a member. Especially, the alumni platforms of Bangladesh University of Textiles are a common gathering of the leading apparel professionals in the industry. I used those platforms to get effective and valid responses. From the member list of BGMEA and ITET, the emails and telephone contacts of the survey recipients were identified. Then the first email invitation, along with the cover letter/recruitment invitation letter, consent form, and the Qualtrics survey link, was sent to the survey recipients. If a participant felt he/she was not the right person to answer the survey, he/she was instructed to forward the survey to an appropriate person. After one week of the initial email invitation, a reminder email was sent. The targeted number of valid responses was 250. After a week from the reminder email, follow-up calls were made until the minimum target number of responses was achieved. The calling process was repeated for those who could not be reached for the first time.

Content Validity

Content validity is supported if there is an agreement between the participants and the researcher that the items are able to effectively cover the area of the subject of the research (Shin et al., 2000). Content validity is usually determined independently of the statistical representations. In this study, a thorough literature review, academic expert review, industry expert review, pilot study, and questionnaire refinement helped ensure content validity.

Data Analysis

Data Screening

After the completion of the survey, screening and cleaning of the data were performed according to the method suggested by Hair et al. (2015). The unqualified data were eliminated based on the survey responses to the attention check questions. The dataset was examined visually utilizing histograms, scatterplots, and boxplots to assess the univariate normality of the data. Through this process, the outliers were identified and eliminated. The multicollinearity of the data was also examined. The variance inflation factor (VIF) greater than 10 or the tolerance smaller than 0.1 were indications of multicollinearity (Kline, 2016).

Analysis of demographic information included (1) level of education, (2) gender, (3) designation in the current company, (4) company size in yearly turnover and company size in the number of employees, (5) years of experience in the apparel industry, (6) years of experience working in the current firm, (7) responsibility at the current position, and (8) the type of products they manufacture.

In survey research, non-response bias is a concern for the researcher. Early and late respondents' responses may vary (Clottey & Grawe, 2014). A comparison was made between early respondents and the respondents who responded after follow-up steps. All the responses were divided into two groups based on early and late returned surveys, and a test of non-response bias was conducted to see whether these two groups were significantly (statistically) different (Clottey & Grawe, 2014).

Another concern of survey research is common method bias. It refers to bias because of external circumstances, such as collecting data using a single method (data collection through online survey only) (Fuller et al., 2016). To minimize the common method bias, the anonymity of the respondents was assured and attention was paid to avoid dependent variable statements being located close to the independent variable statements in the questionnaire. Harman's single-factor test was conducted using exploratory factor analysis (EFA) to evaluate the possibility of the common method bias (Fuller et al., 2016; Macedo, 2017).

Hypothesis Testing

In this proposed study, a two-stage structural equation modeling technique was used to assess the model and test the research hypotheses. There were three reasons to use structural equation modeling:

1. The constructs used in the model were latent variables. The indicators of these factors were observed variables. Structural equation modeling was employed in this study because it can analyze the interactions and relationships between the observed and latent variables (Hair et al., 2011; Kline, 2016).
2. Structural equation modeling can produce an accurate measurement with multiple indicators (Kline, 2016).
3. Structural equation modeling allows simultaneous assessment of the validity and reliability of the theoretical constructs and the estimation of the relationships among those constructs (Kline, 2016; Raykov & Marocoulides, 2006).

The measurement model's reliability, convergent validity, and discriminant validity were evaluated using confirmatory factor analysis (CFA). Then the relationships among the constructs were analyzed by structural equation modeling. The direction and significance of the hypothesized relationships were tested. Statistical software tool 'Mplus' was used to conduct CFA and structural equation modeling.

Measurement Model

According to the suggestion of Hair et al. (2015), confirmatory factor analysis (CFA) should be used to ensure that the measurement model has a sufficient level of goodness-of-fit before evaluating the other psychometric features. The ratio of Chi-square and degree of freedom (χ^2/degree of freedom) was used to test the goodness-of-fit of the measurement model because this is less sensitive to sample size (Schumacker & Lomax, 2004). In addition, Tucker Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) were used to assess the model fit. CFI and TLI values greater than 0.9 indicate a good fit of the model. RMSEA value less than 0.8 indicates a good fit.

Reliability. Reliability is one of the fundamentals of psychometric properties. In this study, Cronbach's alpha was used to assess the internal consistency of the variables by using SPSS. The Cronbach's alpha value ranges from 0 to 1. Higher values of Cronbach's alpha reflect higher reliability. The general rule of thumb is that a Cronbach's alpha coefficient higher than 0.7 indicates high reliability (Peter, 1979; Ullman & Bentler, 2012). If the alpha values of the constructs are greater than 0.7, they are considered reliable constructs (Fink & Litwin, 1995; Peter, 1979; Ullman & Bentler, 2012).

For this study, the composite reliability (CR) of the construct was also assessed. CR is computed based on standardized indicator loadings and error variances (Kline, 2016). A composite reliability value greater than 0.7 indicates a reliable measurement of the latent construct (Hair et al., 2015).

Convergent Validity. Validity means whether the data measures what it is supposed to measure (Peter, 1981). Convergent validity is supported if the intercorrelations among a set of indicators are presumed to measure the same construct and are large in magnitude (Hair et al., 2015). Standardized factor loadings that are large and significant would be viewed in support of the convergent validity (Hair, 2009; Hair et al., 2011; Peter, 1981). The value of 0.7 was used as the threshold for this study. In addition, the average variance extracted (AVE) was examined to assess convergent validity. AVE can be computed as the mean variance extracted for the items loading on a construct and can be considered as the summary indicator of the convergence (Hair et al., 2015). According to Hair et al. (2015), a common rule of thumb is the value of AVE should be greater than or equal to 0.5.

Discriminant Validity. Discriminant validity can be defined as "the extent to which a construct is truly distinct from another construct" (Hair et al., 2015, p. 619). Discriminant validity is used to check whether we are using factors that are highly correlated. Maybe we mistakenly measure the same thing with a different name. Therefore, discriminant validity is critical. Poor discriminant validity is evidenced by very high factor correlations (Hair, 2009; Peter, 1981). If two factors are highly correlated, the two factors might be collapsed into a single factor. Another conservative test is to compare the AVE values and squared correlations between latent constructs. That is, when the AVE value of each of the latent constructs is higher than the highest squared correlation with any other latent construct, discriminant validity is ensured (Hair et al., 2015). In this study, both tests were conducted to assess the discriminant validity of the measurement model.

Structural Model

After confirming all the psychometric properties in the measurement model, the structural model was analyzed using structural equation modeling. The ratio of Chi-square and degree of freedom (χ^2/degree of freedom < 5), Tucker Lewis Index (TLI > 0.9), Comparative Fit Index (CFI > 0.9), and root mean square error of approximation (RMSEA < 0.08) value were used to test the model fit. All the proposed hypotheses were tested using structural equation modeling -- latent variable path analysis. The standardized path parameter estimates and their significance (p-values) were examined for hypothesis testing (Hair et al., 2015).

Summary

This chapter presents the research methodology that aimed to achieve the three research objectives in this quantitative study. The chapter includes a description of the instrument development and sampling procedure, and it also explains the pilot study, data collection procedure, and data analysis process.

CHAPTER IV: RESULTS

This chapter includes five sections: (1) Description of Sample and Responses; (2) Measurement Model Analysis; (3) Structural Model Analysis; (4) The Alternative Models; and (5) Summary of the Chapter.

The first section provides a detailed picture of the characteristics of the sample and responses and data cleaning processes. The second section gives the detailed results of the measurement model analysis. The third section reports a description of the structural model analysis and the results of the hypothesis testing. The fourth section provides analysis results of the two alternative models. The fifth section provides a summary of this chapter.

Description of Sample and Responses

Response Rate

The link of the Qualtrics survey was distributed among 4315 potential respondents. A total of 429 responses were recorded after sharing the initial link of the survey and several subsequent follow-ups. The gross response rate was recorded as 9.94%. Among these 429 responses, 24 rejected the informed consent form (5.6% of 429 responded), and 29 did not complete their responses (6.7% of 429 responded). Thus, a total of 53 responses were excluded due to the above-mentioned reasons. The final usable survey sample size was 376 after deleting incomplete and rejected consent responses (adjusted response rate = 8.71%). Considering the fact that the company managers and senior leadership population have a very busy schedule, and their time is very valuable, the adjusted response rate in this study can be regarded as good (Huo et al., 2019). Data collection results and response rates are illustrated in detail in Table 9.

Table 9. Survey Response Rate

	Count
Total distribution	4315
Total response recorded	429
Gross response rate	9.94%
Less incomplete responses	29
Less responses that rejected informed consent	24
Adjusted sample size	376
Adjusted response rate	8.71%

Data Cleaning

DeSimone et al. (2015) noted that there might be significant differences in answer quality since survey participants vary in their degrees of attention and effort while responding to questions. These variations can cause the statistical analysis and findings to be skewed (Kline, 2016; Raykov & Marocoulides, 2006). Accordingly, the sample (N = 376) underwent data cleaning and screening processes, as per Hair et al. (2015), to ensure the standard of the following analyses and SEM procedures.

According to Hair et al.'s (2015) suggestion, each of the responses was examined manually. Before arriving at the final adjusted respondent count of 376, responses with missing data were first removed from the dataset. The treatment for missing data was no longer required to be used at the data cleaning step since incomplete replies were already eliminated (Hair et al., 2015). The survey included that the respondents should have at least two years of experience in the apparel industry. Fifty-nine respondents who did not have at least two years of experience were found and removed from the dataset. The survey also included two attention-check questions to ensure the full attention of the respondents while responding to the survey. A total of 96 responses did not answer the attention-check questions correctly. Therefore, these 96 responses were removed from the dataset. After removing less experienced and less attentive responses, a total of 221 responses were retained for further statistical analysis. Table 10 lists the outcomes of the data cleaning and screening.

Table 10. Results of Data Cleaning

	Count
Adjusted sample size	376
Responses excluded for further statistical analysis	
Experience less than two years	59
Failed attention check questions	96
Final sample for analysis	221

Non-Response Bias

Wilson (1999) noted that non-response bias might possibly distort the findings in business relationship research; therefore, a test for non-response bias was carried out using the cleaned dataset. The non-response bias analysis aims to determine whether managers who responded after follow-ups significantly differed due to factors external to the research (Armstrong & Overton, 1977; Clottey & Grawe, 2014; R. M. Groves & Peytcheva, 2008). The dataset (N=221) was therefore divided into two groups according to the responses recorded during the initial and follow-ups. After dividing the dataset into two groups, a one-way Analysis of Variance (ANOVA) was performed. According to the ANOVA results, for all the constructs, these two groups (initial responses and follow-up responses) are not significantly different (at $p < 0.05$). So, the results suggested that there is no sign of non-response bias in the cleaned data. The ANOVA results are reported in Table 11.

Table 11. ANOVA Results of Non-Response Bias Test

	Test Statistics	
Constructs	F-Ratio	p-Value
Personal Involvement	1.27	0.26
Apparel Technology Knowledge	1.23	0.27
Knowledge of Impact of Apparel Production on the Environment	2.03	0.16
Sustainable Technology Readiness	0.05	0.83

Relative Advantage	0.62	0.43
Facilitating Conditions	0.002	0.97
Social Influence	0.04	0.84
Adoption Intention	1.77	0.18

Common Method Bias

Common method bias describes the bias resulting from external factors, such as data collection using just one technique (an online survey) (Fuller et al., 2016). To minimize the common method bias, the anonymity of the respondents was assured, and attention was paid to avoid dependent variable statements being located close to the independent variable statements in the questionnaire. Harman's single-factor test was conducted using exploratory factor analysis (EFA) (Principal Axis Factoring was selected) to evaluate the possibility of the common method bias (Fuller et al., 2016; Macedo, 2017). According to Harman's single-factor test, a common method bias is assumed if the amount of variance extracted is more than 50%. Statistical software package SPSS was used to conduct the test. The SPSS results showed that the amount of variance extracted was 28.97%, which is way less than 50%. So, there was no indication of common method bias in the dataset.

Test of Multicollinearity

Two sets of regression were conducted in SPSS to check the multicollinearity of the data: (1) Sustainable Technology Readiness (STR) is the dependent variable in the regression model where Personal Involvement (PI), Apparel Technology Knowledge (ATK), and Knowledge of Impact of Apparel Production on Environment (KIA) are the independent variables; (2) Adoption Intention (AI) is the dependent variable in the regression model, where Sustainable Technology Readiness (STR), Relative Advantage (RA), Facilitating Conditions (FC), and Social Influence (SI) are the independent variables. The VIF values were checked in the SPSS output. The VIF values are less than 10. So, there was no sign of multicollinearity. Table 12 reports the VIF and tolerance values.

Table 12. Result of Testing Multicollinearity

	Collinearity Statistics	
Variables	Tolerance	VIF
Personal Involvement (PI)	.766	1.305
Apparel Technology Knowledge (ATK)	.509	1.964
Knowledge of the Impact of Apparel Production on the Environment (KIA)	.607	1.647
Sustainable Technology Readiness (STR)	.529	1.889
Relative Advantage (RA)	.683	1.465
Facilitating Conditions (FC)	.550	1.819
Social Influence (SI)	.544	1.837

Demographic Characteristics of the Sample

Table 13 summarizes the demographic characteristics of the respondents (N=221). The respondents were from different types of apparel firms. The types of apparel firms included knit garments (41.2%), woven garments (38.9%), companies that have both knit and woven operations (12.6%), garment washing (Denim/Non-denim) (1.8%), and others (5.4%). Survey respondents worked in firms of different sizes. 9.5% of the respondents were from firms that have less than 1,000 employees; 8.6% were from firms having 1,001 to 3,000 employees; 7.2% were from firms having 3,001 to 5,000 employees; 4.5% were from firms having 5,001 to 8,000 employees; and 70.1% were from firms having more than 8,000 employees. Moreover, 7.7% of the respondents belonged to firms having a yearly turnover of 10 to 50 million USD; 11.8% of the respondents were from firms having a yearly turnover of 51 to 100 million USD; 11.3% of the respondents were from firms having a yearly turnover 101 to 150 million USD; and 69.2% of the respondents were from firms having a yearly turnover more than 150 million USD.

The sample comprised respondents from different levels of management. Specifically, 45.2% of respondents held the executive position; 12.2% were assistant managers; 7.7% were managers; 5% were deputy managers; 4.5% were senior managers, and 25.4% held other position titles (e.g., assistant general manager, deputy general manager, assistant director, etc.). Furthermore, 36.2% of the respondents were from merchandising department; 29.9% were from the production department; 18.1% were from the supply chain operation department; 2.7% were from the administration department; and 13.2% were from other departments (e.g., commercial and other related operations, etc.).

The apparel professionals who responded to the survey had a strong educational background. 34.4% of the respondents had a master's or above degree; 62.4% had a bachelor's degree, and only 3.2% had no bachelor's degree. Moreover, 80.1% had a bachelor's or master's degree in STEM areas (science/technology/engineering/mathematics), and 19.9% had degrees in non-STEM areas. As the medium of instruction in higher education in Bangladesh is English, this education profile of the respondents justifies the decision to conduct the survey in the English language. Also, the respondents were professionals with convincing apparel industry experience. 62.9% of them had 2 to 5 years of apparel industry experience. Respondents with 6 to 9 and more than 10 years of experience accounted for 19% and 18.1% respectively. From these data, it may be inferred that the sample's respondents possess the necessary knowledge to answer the survey questions.

Among all the respondents in the sample, 88.2% were male (n=195), and 11.8% were female (n=26). Despite the fact that women make up the majority of the workforce in the apparel business worldwide (Watchravesringkan et al., 2013), the survey sample's inverse distribution showed that males are overrepresented in managerial positions in Bangladesh (Hodges et al., 2010). Such a distribution also implies that women in Bangladesh's garment sector do not have a greater prospect of climbing to middle or senior management positions.

Table 13. Demographic Characteristics of the Sample

		Frequency	Percentage
Firm type	Knit garment	91	41.2
	Woven garment	86	38.9
	Both Knit and Woven	28	12.6
	Garment washing	4	1.8
	(Denim/Non-denim)	12	5.4
	Others		
Number of employees of the firm	Less than 1000	21	9.5
	1001 to 3000	19	8.6
	3001 to 5000	16	7.2
	5001 to 8000	10	4.5
	More than 8000	155	70.1
Yearly turnover (Million USD)	10 to 50	17	7.7
	51 to 100	26	11.8
	101 to 150	25	11.3
	More than 150	153	69.2
Designation	Executive	100	45.2
	Assistant Manager	27	12.2
	Deputy Manager	11	5.0
	Manager	17	7.7
	Senior Manager	10	4.5
	Assistant General Manager	4	1.8
	Deputy General Manager	4	1.8
	Assistant Director	1	0.5
	Others	47	21.3
Responsibility	Merchandising	80	36.2
	Production	66	29.9
	Supply Chain	40	18.1
	Administration	6	2.7
	Commercial and other	1	0.5
	related operation	28	12.7
	Others		
Education	Master’s or above	76	34.4
	Bachelor’s	138	62.4
	Do not have a bachelor’s degree	7	3.2
		177	80.1
	STEM-Higher Education	44	19.9
	Non-STEM-Higher Education		
Experience at the firm working currently (Years)	2 to 5	167	75.6
	6 to 9	35	15.8
	10 or more	19	8.6

Total experience in the apparel industry (Years)	2 to 5	139	62.9
	6 to 9	42	19.0
	10 or more	40	18.1
Gender	Male	195	88.2
	Female	26	11.8

Preliminary Data Analysis

As all the items in the survey were adapted from previously published research in various different contexts, a preliminary analysis of the data was conducted to ensure and retain the most reliable items of the constructs to measure the scales. This preliminary data analysis included a series of exploratory factor analyses (EFA) to check the structure of the constructs and the internal reliability of the scales.

For Sustainable Technology Readiness, it was operationalized as a concept including four dimensions of technology readiness – optimism, innovativeness, insecurity, and discomfort (Parasuraman, 2000). The scales adopted for this study were developed by Parasuraman (2000) and Parasuraman and Colby (2015) in the context of the consumers of the United States. The items of insecurity and discomfort were negatively worded (reverse coding was applied in data analysis). Thus, to ensure the consistency of all the items measuring this construct, a confirmatory factor analysis (CFA) was conducted to evaluate the amount of variance in the items attributed to the four dimensions of sustainable technology readiness. It was found that the items of insecurity and discomfort did not perform well in measuring these two dimensions. Table 14 shows the standardized factor loadings and R-square values of the items measuring discomfort and insecurity. As the factor loadings are too low and R-square values are much lower than the acceptable limit (0.5), there might be a possibility that these items create problems in the model. Due to this concern, the items of insecurity and discomfort were not retained in the scale measuring the construct of "Sustainable Technology Readiness."

Table 14. The Rationale for Dropping Discomfort and Insecurity

Sub-Construct	Items	Standardized Factor Loading	R-square
Discomfort	Sometimes, I think that sustainable technology systems are not designed for use by ordinary people	-0.28	0.07
	There is no such thing as a manual for a sustainable high-tech machine that's written in plain language	-0.42	0.17
	New sustainable technology makes it too easy for governments and companies to spy on people	-0.49	0.23
	Sustainable technology always seems to fail at the worst possible time.	-0.28	0.07
Insecurity	Whenever something gets automated, I need to check carefully that the system is not making mistakes.	-0.33	0.11
	People are too dependent on technology to do things for them	-0.32	0.10
	Too much technology distracts people to a point that is harmful	-0.13	0.01
	It can be risky to switch to a revolutionary new sustainable technology too quickly	-0.16	0.02

Based on the exploratory factor analysis (EFA) results, the four highest-loaded items of each construct were retained for further subsequent statistical analysis. For the two dimensions of Sustainable Technology Readiness, optimism and innovativeness, the best two items were kept for each following the EFA results. As a result, the sustainable technology readiness contained a total of four items for subsequent statistical analysis (two items of optimism and two of innovativeness). Table 15 depicts the items retained after preliminary data analysis. Table 15 also reports the values of Cronbach's alpha (α). The Cronbach's alpha value ranges from 0 to 1. Higher values of Cronbach's alpha reflect higher reliability. The general rule of thumb is that a Cronbach's alpha coefficient higher than 0.7 indicates high reliability (Peter, 1979; Ullman & Bentler, 2012). As shown in Table 15, Cronbach's alpha coefficients ranged from 0.76 to 0.88, indicating strong internal consistency among items (Hair et al., 2015).

Table 15. Items Retained After Preliminary Data Analysis

Construct	Item Description	EFA Factor Loading
Personal Involvement (PI) (4 items; Cronbach's alpha = 0.81)	▪ I often get personally involved in matters related to the use of sustainable technology within the firm.	.83
	▪ I would like to gather information about what newer sustainable technologies are introduced by our competitors.	.79
	▪ I like to gather information about the current trend in the use of sustainable technologies in apparel firms.	.87
	▪ As a manager, I am involved in making suggestions or decisions regarding sustainable technology within the firm.	.77
Apparel Technology Knowledge (ATK) (4 items; Cronbach's alpha = 0.80)	▪ I know about modern apparel manufacturing technologies.	.83
	▪ I am knowledgeable about the benefits of the use of modern technologies in apparel firms.	.80
	▪ I frequently read news and articles to learn about the technologies used in the apparel industry.	.77
	▪ I am knowledgeable about the impacts of technologies on apparel manufacturing.	.83
Knowledge about the Impact of Apparel Production on the Environment (KIA) (4 items; Cronbach's alpha = 0.83)	▪ I am knowledgeable about the environmentally responsible apparel business.	.77
	▪ I know the impact of chemicals used in apparel production on the environment.	.81
	▪ In general, I believe I am sufficiently aware of the environmental issues caused by apparel manufacturing.	.86
	▪ I believe I am sufficiently aware of the waste generated by apparel firms.	.83
Sustainable Technology Readiness (STR) (4 items; Cronbach's alpha = 0.78)	*Optimism*	
	▪ Sustainable technology makes you more efficient in your occupation.	.91
	▪ Sustainable technology makes me more productive in my personal life.	.84
	Innovativeness	
	▪ I find I have fewer problems than other people in making sustainable technology work for me.	.82
	▪ I can usually figure out new and sustainable high-tech products and services without help from others.	.86

Relative Advantage of Sustainable Technology (RA) (4 items; Cronbach's alpha = 0.86)	▪ Sustainable technology will allow us to accomplish specific manufacturing tasks more quickly.	.80
	▪ Sustainable technology will allow us to enhance our productivity.	.88
	▪ Sustainable technology will allow us to save time in production.	.92
	▪ Sustainable technology could reduce business operational costs by automating the process.	.78
Facilitating Conditions (FC) (4 items; Cronbach's alpha = 0.84)	▪ I have the necessary resources to use sustainable technology.	.85
	▪ I have the knowledge necessary to use sustainable technology.	.88
	▪ I can get help from others when I have difficulties using sustainable technology.	.77
	▪ Specialized instructions concerning the use of sustainable technology are available to me.	.79
Social Influence (SI) (4 items; Cronbach's alpha = 0.88)	▪ People who are important to me think that I should use sustainable technology.	.86
	▪ People who influence my behavior think that I should use sustainable technology.	.90
	▪ People whose opinions I value prefer that I use sustainable technology.	.89
	▪ The senior management of my company is helpful in the use of sustainable technology.	.78
Adoption Intention (4 items; Cronbach's alpha = 0.76)	▪ I intend to use sustainable technology in the future.	.78
	▪ I predict I would use sustainable technology in the future.	.77
	▪ I will always try to use sustainable technology in my daily life at work.	.78
	▪ I plan to use sustainable technology frequently.	.74

Measurement Model Analysis

KMO Test and Bartlett’s Test of Sphericity

Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett’s test of sphericity were conducted using the statistical software package SPSS. The goal of the KMO test is to create an index that shows what percentage of the variance in the items may be a common variance (Dziuban & Shirkey, 1974; Kaiser, 1963; Kendall, 1957). In order to determine if the collected data accurately reflect the latent constructs that the measurement model aims to measure, the KMO index value is used. The study of Dziuban and Shirkey (1974) and Kendall (1957) assert that to perform a robust factor analysis, the KMO value, which runs from 0 to 1, needed to be more than 0.5.

By comparing a correlation matrix to the identity matrix, Bartlett's test of sphericity determines whether there is a significant difference (Bartlett, 1950). The correlation matrix's variables can be used for factor analysis if Bartlett's test yields a significant result. Table 16 reports the results of KMO statistics and Bartlett's test of sphericity. The KMO statistics for the constructs ranged from 0.66 to 0.82, and the results of Bartlett's test of sphericity for all the constructs were significant; therefore, the data were suitable for further statistical analysis (confirmatory factor analysis).

Table 16. KMO Measure and Bartlett's Test of Sphericity Result

Construct	KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity Approx. Chi-Square (df)	Sig.
Personal Involvement (PI)	.76	353.63 (6)	0.001
Apparel Technology Knowledge (ATK)	.78	305.63 (6)	0.001
Knowledge of the Impact of Apparel Production on the Environment (KIA)	.76	357.51 (6)	0.001
Sustainable Technology Readiness (STR)	.66	327.80 (6)	0.001
Relative Advantage (RA)	.79	457.21 (6)	0.001
Facilitating Conditions (FC)	.79	360.30 (6)	0.001
Social Influence (SI)	.82	476.06 (6)	0.001
Adoption Intention (AI)	.73	226.15 (6)	0.001

Note. N=221

Confirmatory Factor Analysis

According to the suggestion of Raykov and Marocoulides (2006), confirmatory factor analysis (CFA) was performed to ensure that the measurement model has a sufficient level of goodness-of-fit and satisfactory psychometric features. The model parameters were estimated using maximum likelihood estimation (MLE), which was used since the measurement model is recursive and completely identifiable (Kline, 2011; Raykov & Marocoulides, 2006). Since the measurement model is a latent construct model, Structural Equation Modeling (SEM) using the MLE technique can statistically assess the goodness-of-fit for the confirmatory factor solution.

As suggested by Raykov and Marocoulides (2006), the CFA should assess three types of fit statistics: absolute fit, incremental fit, and parsimonious fit. Absolute fit metrics evaluate the global data fit of the model along with the overall structural and measurement model fit. Measures of incremental fit compare the research model to a different known model in the data. Measures of parsimonious fit consider the model complexity and adjust accordingly for the number of hypothesized relationships in the model (Kline, 2016; Raykov & Marocoulides, 2006). Existing literature suggests that multiple measures of fit are used when reporting the results of CFA and SEM (Raykov & Marocoulides, 2006). Measurement model fit statistics are reported in Table 17.

Table 17. Summary of the Measurement Model Goodness of Fit

Fit Type	Fit Measure	Fit Guideline Criteria*	Proposed Model	Acceptance
Absolute fit	Chi-square	P>0.05	P<0.001	No
	Normed Chi-square (χ2/degree of freedom)	2-5	2.12	Yes
	Standardized root mean square residual (SRMR)	<0.08	.06	Yes
Incremental fit	Comparative fit index (CFI)	>0.90	.87	No
Parsimonious fit	Root mean square error of approximation (RMSEA)	<0.08	.07	Yes

Note. * Source: Hu and Bentler (1999).

The Chi-square statistic is found significant ($\chi 2$ = 925.844, df = 436, p < 0.00001). This means that the data does not fit the hypothesized model (Hair et al., 2015). Chi-square statistic is very sensitive to sample size. It may be misleading to make a decision based on Chi-square statistics only. To address this issue, statistical scholars contended that a ratio of Chi-square and degree of freedom (commonly known as the Normed Chi-square test) could be a more suitable measure while deciding about the model fit in structural equation modeling (Hu & Bentler, 1999; Raykov & Marocoulides, 2006). In this study, the normed Chi-square was found to be 2.12, below the cutoff level of 5, as suggested by Hu and Bentler (1999). The SRMR (standardized root mean square) value was found to be 0.063, which is also lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). The RMSEA (root mean square error of approximation) value was found to be 0.071, which is lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). The CFI (comparative fit index) value was found 0.87, which is acceptable although slightly less than the suggested cutoff level of 0.9. It is clear from the fit statistics that the measurement model overall exhibits adequate and acceptable levels of fit.

Evaluation of Parameter Estimates

Table 18 reports the unstandardized factor loading, t-statistics, and completely standardized factor loadings. Each of the constructs was measured by four items. For the measure of personal involvement, standardized factor loadings ranged from 0.67 to 0.85. For the measure of apparel technology knowledge, standardized factor loadings ranged from 0.69 to 0.78. For knowledge about the impact of apparel production on the environment, standardized factor loadings ranged from 0.69 to 0.82. For sustainable technology readiness, standardized factor loadings ranged from 0.68 and 0.73. For relative advantage, facilitating conditions, social influence, and adoption intention, their items' standardized factor loadings ranged from 0.69 to 0.91, from 0.67 to 0.85, from 0.68 to 0.86, and from 0.65 to 0.71, respectively.

According to the CFA results of the multi-item scales in the measurement model, the indicators for each construct were all statistically significant, with standardized factor loadings greater than 0.5, which demonstrates that the items are adequate for measuring the study constructs (Hair et al., 2011; Kline, 2016; Raykov & Marocoulides, 2006).

Table 18. Results of the Measurement Model: Factor Loadings and t-statistics

Constructs	Items	Unstandardized Factor Loading	t-statistics	Completely Standardized Factor Loading (λ)
Personal Involvement (PI)	PI1	1.00		0.74
	PI2	0.76	9.69	0.74
	PI3	0.80	10.69	0.85
	PI4	1.01	9.49	0.67
Apparel Technology Knowledge (ATK)	ATK1	1.00		0.73
	ATK2	0.82	9.74	0.69
	ATK4	1.44	9.72	0.73
	ATK5	1.01	10.42	0.78
Knowledge about the Impact of Apparel Production on the Environment (KIA)	KIA2	1.00		0.69
	KIA3	1.01	9.41	0.71
	KIA4	1.30	9.53	0.82
	KIA5	1.26	9.42	0.79
Sustainable Technology Readiness (STR)	STRO4	1.00		0.68
	STRO6	0.90	8.75	0.64
	STRINV4	1.25	7.37	0.73
	STRINV5	1.43	7.03	0.73
Relative Advantage (RA)	RA2	1.00		0.72
	RA3	1.32	12.09	0.85
	RA4	1.30	12.45	0.91
	RA5	1.15	9.67	0.69
Facilitating Condition (FC)	FC1	1.00		0.81
	FC2	0.93	13.94	0.85
	FC3	0.60	10.09	0.67
	FC4	0.78	10.64	0.70
Social Influence (SI)	SI1	1.00		0.82
	SI2	1.12	14.90	0.86
	SI3	1.06	14.72	0.86
	SI4	0.79	10.63	0.68
Adoption Intention	AI1	1.00		0.66
	AI2	1.13	8.20	0.65

(AI)	AI3	1.46	7.69	0.71
	AI4	1.47	7.27	0.66

Note. 1. Λ (Lambda): Completely Standardized Factor Loading Value. The first λ path was set to 1; therefore, t-values are not reported.

2. All factor loadings were significant at $p < 0.001$.

Figure 8 is the diagram of the measurement model containing the indicating variables and the latent constructs that shows the unstandardized parameter estimates. The measurement model with completely standardized parameter estimates is presented in Figure 9. All path parameter estimates' *p*-values are less than 0.05, making them all statistically significant ($p < 0.05$).

Figure 8. Measurement Model with Unstandardized Parameter Estimates

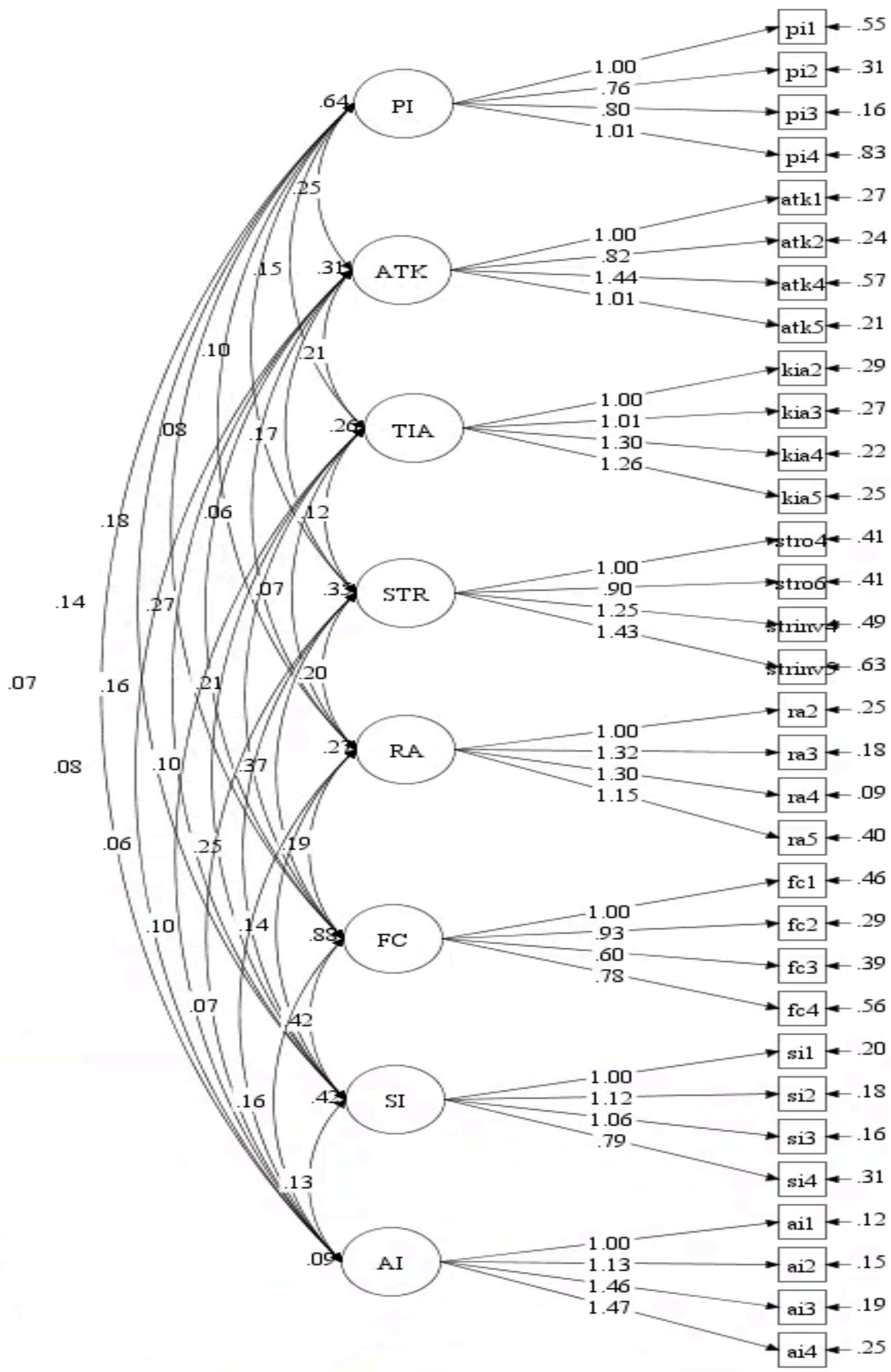
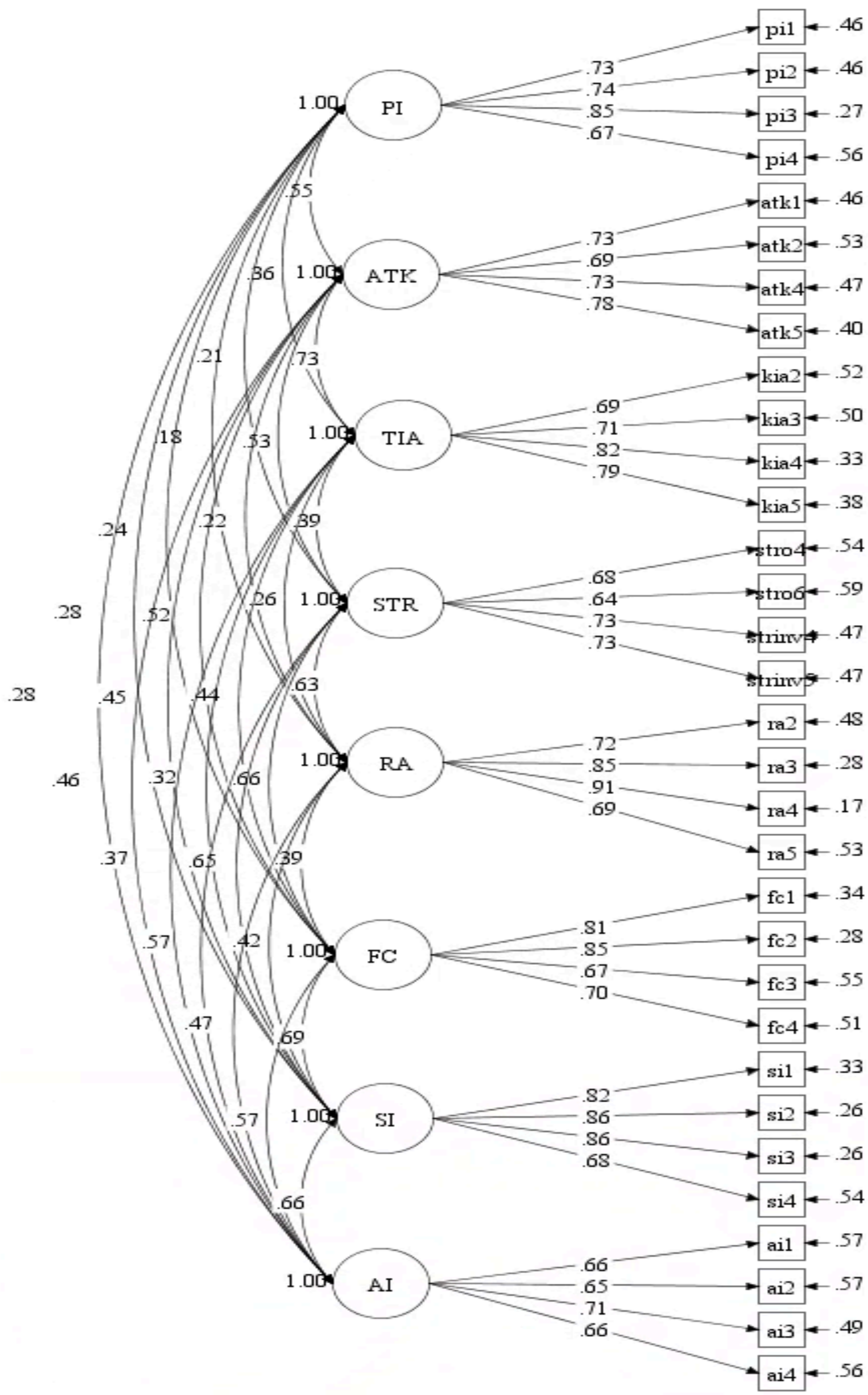


Figure 9. Measurement Model with Standardized Parameter Estimates



Psychometric Properties

Reliability

Table 19 presented the psychometric properties of the measurement model, which were obtained and evaluated for the validity and reliability of the measurement items. The consistency of the measuring scales needed to be examined because it is important to check whether the indicator variables are correctly loading on the underlying latent constructs. To ensure that the multiple-item scales were reliable, reliability analysis utilizing composite reliability (CR) was carried out for each of the constructs. The CR coefficients of the constructs varied from 0.77 to 0.88, indicating that the items in the scales exhibited high composite reliability (acceptable if greater than 0.7) in estimating the underlying latent constructs (Kline, 2016).

Table 19. Measurement Reliability and Validity

Constructs	Items	Standardized Factor Loading (λ)	Composite Reliability (CR)	Cronbach's α	Average Variance Extracted (AVE)
Personal Involvement (PI)			0.84	0.81	0.57
	PI1	0.74			
	PI2	0.74			
	PI3	0.85			
	PI4	0.67			
Apparel Technology Knowledge (ATK)			0.82	0.80	0.54
	ATK1	0.73			
	ATK2	0.69			
	ATK4	0.73			
	ATK5	0.78			
Knowledge about Impact of Apparel Production on the Environment (KIA)			0.84	0.83	0.57
	KIA2	0.69			
	KIA3	0.71			
	KIA4	0.82			
	KIA5	0.79			
			0.79	0.78	0.49
	STRO4	0.68			

Sustainable	STRO6	0.64			
Technology	STRINV4	0.73			
Readiness	STRINV5	0.73			
(STR)					
Relative			0.87	0.86	0.64
Advantage	RA2	0.72			
(RA)	RA3	0.85			
	RA4	0.91			
	RA5	0.69			
Facilitating			0.85	0.84	0.58
Conditions	FC1	0.81			
(FC)	FC2	0.85			
	FC3	0.67			
	FC4	0.70			
Social			0.88	0.88	0.65
Influence	SI1	0.82			
(SI)	SI2	0.86			
	SI3	0.86			
	SI4	0.68			
Adoption			0.77	0.76	0.45
Intention	AI1	0.66			
(AI)	AI2	0.65			
	AI3	0.71			
	AI4	0.66			

Validity

Convergent validity is one of the necessary psychometric properties that is required to ensure the approach of structural equation modeling. Convergent validity is supported if the intercorrelations among a set of indicators are presumed to measure the same construct and are large in magnitude (Hair et al., 2015). According to the recommendations of Kline (2016), three measures were used for evaluating convergent validity: factor loading, composite reliability (CR), and average variance extracted (AVE). CFA output generated factor loadings, and then CR and AVE were manually computed using those factor loadings.

Standardized factor loadings that are large and significant would be viewed in support of the convergent validity (Hair, 2009; Hair et al., 2011; Peter, 1981). The measurement model's standardized factor loadings ranged from 0.64 to 0.91, and all were above the threshold of 0.5

suggested by Hair et al. (2015). According to the recommendation of Hair et al. (2015), 0.7 is the threshold for CR for the measurement model's high internal consistency. The values of CR varied from 0.77 to 0.88, which indicated the high internal consistency for the constructs. In addition, the average variance extracted (AVE) can be used to assess convergent validity. AVE can be computed as the mean variance extracted for the items loading on a construct and can be considered as the summary indicator of convergence (Hair et al., 2015). According to the suggestion of Hair et al. (2015), the value of AVE should be greater than or equal to 0.5. As reported in Table 19, AVE values ranged from 0.45 to 0.65. There are two AVE values that are slightly lower than 0.5. Some researchers argued that AVE values can be acceptable as low as 0.2 if the square root of any construct's AVE is greater than any of the correlations among the constructs (Hulland, 1999). The square root values of the AVE statistics are shown in Table 20. The values of square root AVEs varied from 0.67 to 0.81, and all the correlation coefficients were less than the square root of AVE values. Therefore, convergent validity was established for the measurement model with the acceptable measures of factor loadings, CR, and AVE.

Table 20. Correlation Matrix of the Latent Constructs

Construct	Mean	SD	Correlation							
			PI	ATK	KIA	STR	RA	FC	SI	AI
PI	4.35	0.80	**0.75**							
ATK	4.32	0.66	0.55**	**0.73**						
KIA	4.44	0.64	0.36**	0.73**	**0.75**					
STR	4.17	0.77	0.27**	0.56**	0.45**	**0.70**				
RA	4.51	0.66	0.18*	0.22*	0.26**	0.62**	**0.80**			
FC	3.99	0.84	0.24*	0.52**	0.44**	0.66**	0.39**	**0.76**		
SI	4.35	0.69	0.28**	0.45**	0.32**	0.67**	0.42**	0.69**	**0.81**	
AI	4.65	0.44	0.28**	0.46**	0.37**	0.58**	0.47**	0.57**	0.66**	**0.67**

Note. The diagonal values (bold) are the square root of the AVE (average variance extracted) for each construct.

PI = Personal Involvement; ATK = Apparel Technology Knowledge; KIA = Knowledge about the Impact of Apparel Production on the Environment; STR = Sustainable Technology Readiness; RA = Relative Advantage; FC = Facilitating Conditions; SI = Social Influence; AI = Adoption Intention.

* = $p < 0.01$, ** = $p < 0.001$.

Ensuring discriminant validity is critical in structural equation modeling. Poor discriminant validity is evidenced by very high factor correlations (Hair, 2009; Peter, 1981). When two factors are highly correlated, the two factors might be collapsed into a single factor. As presented in Table 20, none of the correlations between the factors are more than 0.8; therefore, discriminant validity was achieved, as suggested by Hair et al. (2015). Another conservative test is to compare the square root of AVE values and correlations between latent constructs. That is, when each latent construct's square root value of AVE is higher than its highest correlation with other latent constructs, discriminant validity is ensured (Hair et al., 2015). As reported in Table 20, the values of square root AVEs varied from 0.67 to 0.81, and none of the correlation coefficients were greater than square root AVE values. Therefore, discriminant validity was established among the factors in the measurement model.

In agreement with the SEM literature (Hair et al., 2015; Kline, 2016; Raykov & Marocoulides, 2006), the measurement model fit, reliability, and validity results were found acceptable to proceed to structural model analysis.

Structural Model Analysis

According to Kline (2016), structural equation modeling's most significant advantage is its ability to estimate relationships in a complicated model with latent construct and simultaneously control for type I error. Thus, keeping the alpha level at 0.05, the hypothesized relationships can be tested using structural modeling. Table 21 reported the fit statistics of the structural model. All the fit indices (Normed Chi-square, SRMR, RMSEA, and CFI) were found acceptable for the structural model, and it was appropriate to move forward to check the hypothesized relationships in the model (Kline, 2016).

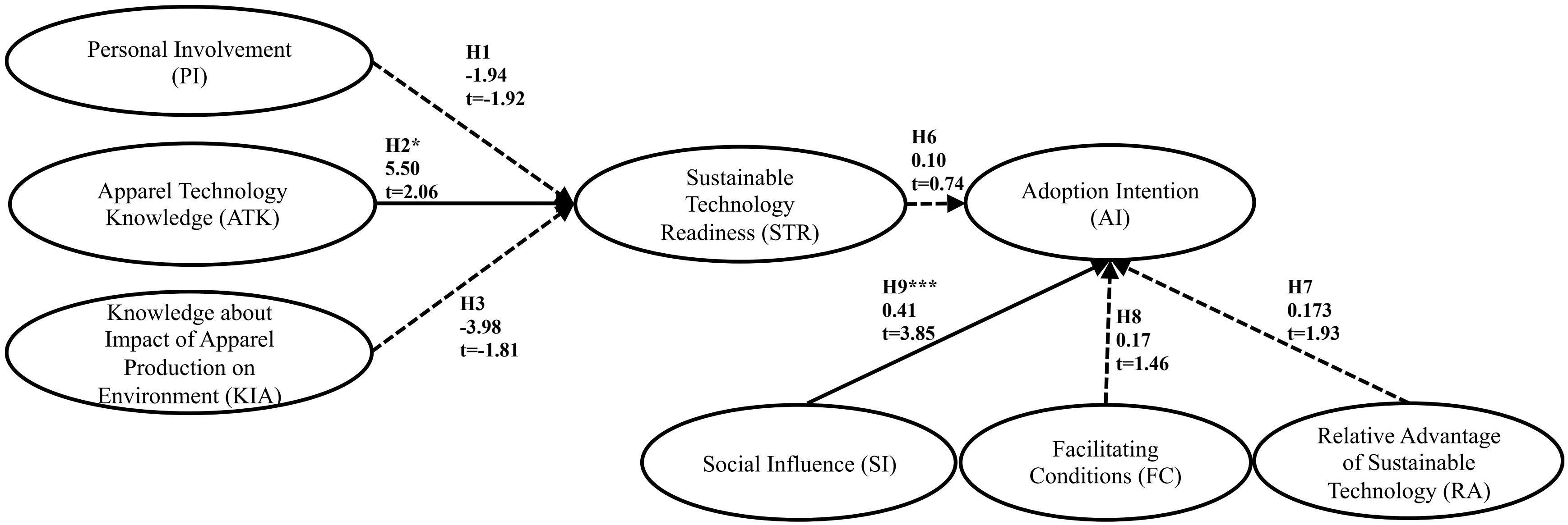
Table 21. Fit Indices of the Structural Model

Measures	Value	Recommended Value
Chi-square	p < 0.001	p > 0.05
Normed Chi-square (χ2/degree of freedom)	2.23	< 5
Standardized root mean squared residual (SRMR)	0.066	< 0.08
Comparative fit index (CFI)	0.856	> 0.90
Root mean square error of approximation (RMSEA)	0.075	< 0.08

The results of the path analysis model are illustrated in Figure 10. The path of personal involvement with sustainable technology readiness (γ = -1.94, t = -1.92, p = 0.055) was not significant. The path between apparel technology knowledge and sustainable technology readiness (γ = 5.50, t = 2.06, p < 0.05) was positive and significant. The path of knowledge of the impact of apparel production on the environment with sustainable technology readiness (γ = -3.98, t = -1.81, p = 0.070) was not found significant.

The path of sustainable technology readiness with adoption intention (β = 0.10, t = 0.74, p = 0.461) was not found significant. The path of the relative advantage of sustainable technology with adoption intention (γ = 0.17, t = 1.93, p = 0.054) was not found significant. The path of facilitating conditions with adoption intention (γ = 0.17, t = 1.46, p = 0.145) was not significant. The path between social influence and adoption intention (γ = 0.41, t = 3.85, p < 0.05) was found positive and significant.

Figure 10. Structural Model



Note. Coefficients are completely standardized.

Solid lines indicate that the path coefficients are significant and the hypotheses were supported.

Dashed lines indicate that the path coefficients are not significant and the hypotheses were not supported.

* = $p < 0.05$, *** = $p < 0.001$.

Hypotheses Testing

The hypotheses were tested on the relationships depicted in the structural model. Table 22 and Figure 10 present the hypothesized relationships of the model. The path coefficients of H2 and H9 were found to be positive and significant; therefore, these two hypotheses are supported. The path coefficients of H1, H3, H6, H7, and H8 were not found to be significant; therefore, these hypotheses were not supported. A detailed discussion of these hypotheses is presented in the next chapter.

Table 22. Hypotheses Testing from SEM Results

	Hypotheses	Standardized Path Coefficient	t-value	Supported?
1	Personal involvement (PI) -> Sustainable technology readiness (STR)	-1.94	-1.92	No
2	Apparel technology knowledge of (ATK) -> Sustainable technology readiness (STR)	5.5*	2.06	Yes
3	Knowledge of the impact of apparel production on the environment (KIA) -> Sustainable technology readiness (STR)	-3.98	-1.81	No
6	Sustainable technology readiness (STR) -> Adoption intention (AI)	0.10	0.74	No
7	Relative advantage (RA) ->Adoption intention (AI)	0.17	1.93	No
8	Facilitating conditions (FC) ->Adoption intention (AI)	0.17	1.46	No
9	Social influence (SI) -> Adoption intention (AI)	0.41***	3.85	Yes

Note. * = $p < 0.05$, *** = $p < 0.001$.

Problems in the Structural Model

As Figure 10 and Table 22 illustrate, the standardized path coefficients of H1, H2, and H3 are more than 1 (or less than -1), which is unusual and surprising. The normal value of the standardized path coefficient could range from -1 to +1 (Hair et al., 2015). This unusual standardized path coefficient might indicate the multicollinearity problem. The multicollinearity of the data was checked in the preliminary data analysis stage, and an acceptable range of VIF values was found. As the problem is with the predictor variables of Sustainable Technology Readiness (STR), a further investigation of the correlation matrix of the latent variables was conducted. It was found that the correlation between the latent factor Apparel Technology Knowledge (ATK) and Knowledge of the Impact of Apparel Production on the Environment (KIA) is 0.73 (Table 20), which is high. Both latent constructs (ATK and KIA) are predictors of sustainable technology readiness. It is possible that ATK and KIA overlap to some extent in explaining the variance of sustainable technology readiness. It may be wise to drop one of the predictors (either ATK or KIA).

Thus, to solve the issues related to the unusual standardized path coefficients, two alternative models were suggested in this dissertation, removing either KIA or ATK. The next two sections of this chapter report the CFA and SEM analysis results of these two alternative models.

Alternative Model 1

Measurement Model Analysis of Alternative Model 1

Fit Indices of Alternative Model 1

Confirmatory Factor Analysis (CFA) of the measurement model of the alternative model 1was conducted. The results of the fit statistics are reported in Table 23. The Chi-square statistic is found to be significant ($\chi 2$ = 925.844, *df* = 436, $p < 0.00001$). As the Chi-square statistic is very sensitive to sample size, it may be misleading to make a decision based on Chi-square statistics only (Hair et al., 2015; Hu & Bentler, 1999). Thus, the Normed Chi-square could be a more suitable measure (Hair et al., 2015; Hu & Bentler, 1999). In this alternative model, the Normed Chi-square was found to be 2.15, below the cutoff level of 5, as suggested by Hu and Bentler (1999). The SRMR (standardized root mean square) value was 0.06, which is also lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). The CFI (comparative fit index) value was found to be 0.88, which is slightly less than the suggested cutoff level of 0.9. The RMSEA (root mean square error of approximation) value was 0.07, which is lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). It is clear from the fit statistics of the alternative model 1that the measurement model overall exhibits adequate and acceptable levels of fit.

Table 23. Summary of the Measurement Model Goodness of Fit (Alternative Model 1)

Fit Type	Fit Measure	Fit Guideline Criteria	Proposed Model	Acceptance
Absolute fit	Chi-square	p > 0.05	p < 0.001	No
	Normed Chi-square (χ2/degree of freedom)	2-5	2.15	Yes
	Standardized root mean square residual (SRMR)	<0.08	.06	Yes
Incremental fit	Comparative fit index (CFI)	>0.90	.88	No
Parsimonious fit	Root mean square error of approximation (RMSEA)	<0.08	.07	Yes

Note. Source: Hu and Bentler (1999).

Evaluation of Parameter Estimates of Alternative Model 1

Table 24 reports the unstandardized factor loading, t-statistics, and completely standardized factor loadings. For Personal Involvement (PI) construct, standardized factor loadings ranged from 0.67 to 0.85. For Apparel Technology Knowledge (ATK) construct, factor loadings ranged from 0.70 to 0.76. For Sustainable Technology Readiness (STR), factor loadings ranged from 0.64 to 0.73. For Relative Advantage (RA), factor loadings ranged from 0.69 to 0.91. For Facilitating Conditions (FC), factor loadings ranged from 0.67 to 0.85. For Social Influence (SI), factor loadings ranged from 0.68 to 0.86. Factor loadings ranged from 0.65 to 0.72 for Adoption Intention (AI) construct.

Table 24. Results of the Measurement Model: Factor Loadings and t-statistics (Alternative Model 1)

Constructs	Items	Unstandardized Factor Loading	t-statistics	Completely Standardized Factor Loading (λ)
Personal Involvement (PI)	PI1	1.00		0.74
	PI2	0.76	9.68	0.74
	PI3	0.80	10.68	0.85
	PI4	1.01	9.48	0.67
Apparel Technology Knowledge (ATK)	ATK1	1.00		0.76
	ATK2	0.81	10.08	0.70
	ATK4	1.33	9.42	0.70
	ATK5	0.95	10.17	0.76
Sustainable Technology Readiness (STR)	STRO4	1.00		0.68
	STRO6	0.90	8.77	0.64
	STRINV4	1.24	7.39	0.73
	STRINV5	1.43	7.05	0.73
Relative Advantage (RA)	RA2	1.00		0.72
	RA3	1.32	12.08	0.85
	RA4	1.30	12.44	0.91
	RA5	1.15	9.67	0.69
	FC1	1.00		0.81

Facilitating Condition (FC)	FC2	0.94	13.92	0.85
	FC3	0.60	10.07	0.67
	FC4	0.78	10.61	0.70
Social Influence (SI)	SI1	1.00		0.82
	SI2	1.12	14.90	0.86
	SI3	1.06	14.71	0.86
	SI4	0.79	10.63	0.68
Adoption Intention (AI)	AI1	1.00		0.66
	AI2	1.13	8.16	0.65
	AI3	1.48	7.75	0.72
	AI4	1.48	7.27	0.66

Note. 1. λ (Lambda): Completely Standardized Factor Loading Value. The first λ path for each construct was set to 1; therefore, the *t*-value was not reported.

2. All factor loadings were significant at $p < 0.001$.

Figure 11 is the measurement model diagram (Alternative Model 1) containing the indicator variables and the latent constructs with the results of unstandardized parameter estimates. Figure 12 presents the measurement model (Alternative Model 1) with completely standardized parameter estimates. All path parameter estimates' p-values are less than 0.05, making them all statistically significant ($p < 0.05$). According to the CFA results of the alternative model, the indicators for each construct were statistically significant and all the factor loadings are greater than 0.5; thus, the indicators are adequate for measuring the study constructs (Hair et al., 2011; Kline, 2016; Raykov & Marocoulides, 2006).

Figure 11. Measurement Model with Unstandardized Parameter Estimates (Alternative Model 1)

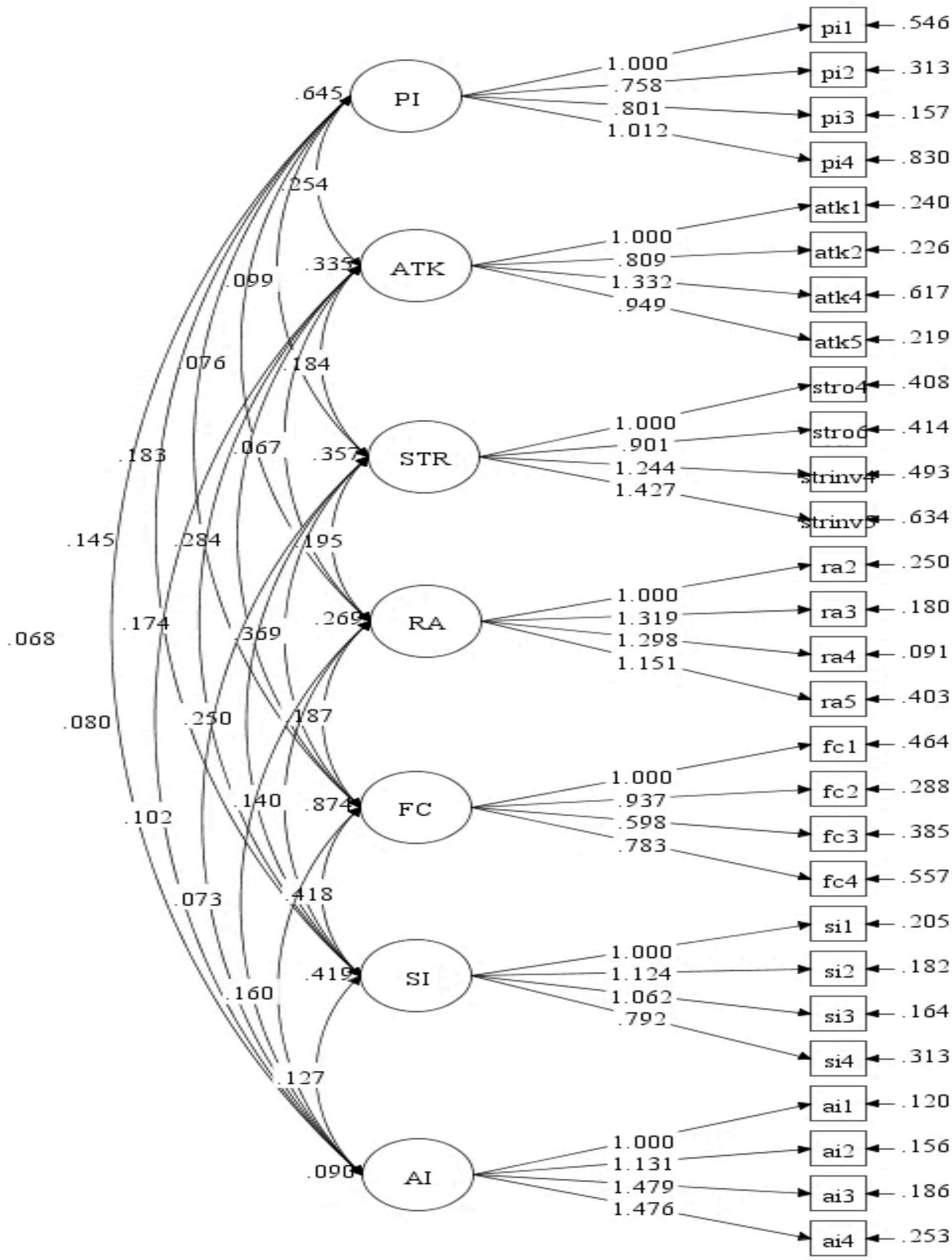
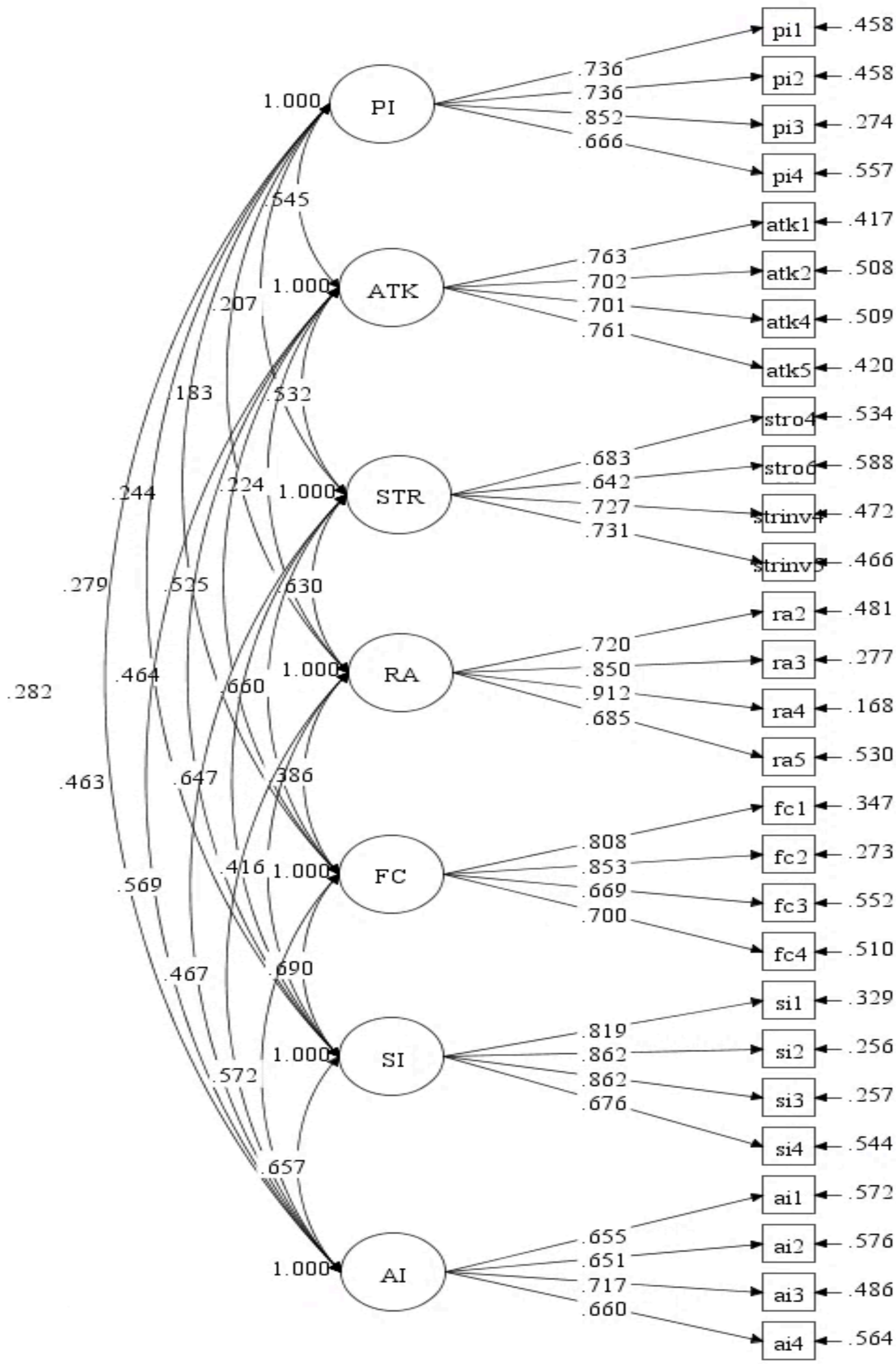


Figure 12. Measurement Model with Standardized Parameter Estimates (Alternative Model 1)



Evaluation of Psychometric Properties of Alternative Model 1

Reliability. Table 25 presents the psychometric properties of the measurement model of the alternative model 1, which were used to evaluate the validity and reliability of the measurement model. The composite reliability coefficients of the constructs varied from 0.77 to 0.88, indicating high composite reliability (acceptable if greater than 0.7) in measuring the underlying latent constructs (Kline, 2016). Table 25 also reported the values of Cronbach's alpha (α). Cronbach's alpha coefficients ranged from 0.76 to 0.88, indicating the scale items' acceptable internal reliability.

Table 25. Measurement Reliability and Validity (Alternative Model 1)

Constructs	Items	Standardized Factor Loading (λ)	Composite Reliability (CR)	Cronbach's α	Average Variance Extracted (AVE)
Personal Involvement (PI)			0.84	0.81	0.57
	PI1	0.74			
	PI2	0.74			
	PI3	0.85			
	PI4	0.67			
Apparel Technology Knowledge (ATK)			0.82	0.80	0.53
	ATK1	0.76			
	ATK2	0.70			
	ATK4	0.70			
	ATK5	0.76			
Sustainable Technology Readiness (STR)			0.79	0.78	0.49
	STRO4	0.68			
	STRO6	0.64			
	STRINV4	0.73			
	STRINV5	0.73			
Relative Advantage (RA)			0.87	0.86	0.64
	RA2	0.72			
	RA3	0.85			
	RA4	0.91			
	RA5	0.69			
Facilitating Conditions (FC)			0.84	0.84	0.58
	FC1	0.81			
	FC2	0.85			

	FC3	0.67			
	FC4	0.70			
Social Influence (SI)			0.88	0.88	0.65
	SI1	0.82			
	SI2	0.86			
	SI3	0.86			
	SI4	0.68			
Adoption Intention (AI)			0.77	0.76	0.45
	AI1	0.66			
	AI2	0.65			
	AI3	0.72			
	AI4	0.66			

Validity. The measurement model's (alternative model 1) standardized factor loadings ranged from 0.64 to 0.91, and all were above Hair et al. (2015)'s suggested threshold of 0.5. The values of composite reliability (CR) varied from 0.77 to 0.88, which indicated that the scale items presented high internal consistency for the constructs (Hair et al., 2015). As reported in Table 25, AVE values ranged from 0.45 to 0.65. Two AVE values are slightly lower than 0.5. According to Hulland (1999), the AVE values are considered acceptable as the values of square root of AVEs varied from 0.67 to 0.81 and all the correlation coefficients between the constructs were less than the square root of AVEs (Table 26). In addition, as presented in Table 26, none of the correlations between the factors are more than 0.8; therefore, discriminant validity was achieved, as suggested by Hair et al. (2015). In agreement with the SEM literature (Hair et al., 2015; Kline, 2016), the results of measurement model fit, reliability, and validity were deemed satisfactory to proceed to structural regression model analysis of the alternative model 1.

Table 26. Correlation Matrix of the Latent Constructs (Alternative Model 1)

Construct	Mean	SD	Correlations						
			PI	ATK	STR	RA	FC	SI	AI
PI	4.35	0.80	**0.75**						
ATK	4.32	0.66	0.55**	**0.73**					
STR	4.17	0.77	0.21*	0.53**	**0.70**				
RA	4.51	0.66	0.18*	0.22*	0.63**	**0.80**			
FC	3.99	0.84	0.24*	0.52**	0.66**	0.39**	**0.76**		
SI	4.35	0.69	0.28**	0.46**	0.65**	0.42**	0.69**	**0.81**	
AI	4.65	0.44	0.28**	0.46**	0.57**	0.47**	0.57**	0.66**	**0.67**

Note. The diagonal values (bold) are the square root of the AVE (average variance extracted) for each construct.

PI = Personal Involvement; ATK = Apparel Technology Knowledge; STR = Sustainable Technology Readiness; RA = Relative Advantage; FC = Facilitating Conditions; SI = Social Influence; AI = Adoption Intention.

* = $p < 0.01$, **= $p < 0.001$.

Structural Model Analysis of Alternative Model 1

Table 27 reported the fit statistics of the structural model of the alternative model 1. Normed Chi-square and RMSEA were found satisfactory. SRMR (0.09) and the Comparative fit index (CFI) (0.856) were close to the recommended criteria. Thus, the structural model was deemed to have an acceptable fit, and it was appropriate to move forward to check the hypothesized relationships in the model (Kline, 2016; Raykov & Marocoulides, 2006).

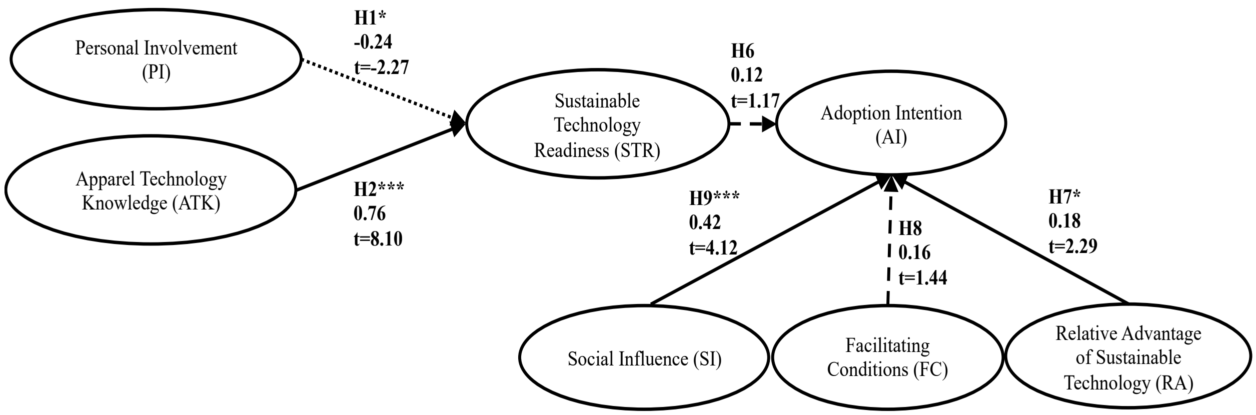
Table 27. Fit Indices of the Structural Model (Alternative Model 1)

Measures	Value	Recommended Value
Chi-square	$p < 0.001$	$p > 0.05$
Normed Chi-square ($\chi 2$/degree of freedom)	2.40	< 5
Standardized root mean squared residual (SRMR)	0.09	< 0.08
Comparative fit index (CFI)	0.86	> 0.90
Root mean square error of approximation (RMSEA)	0.08	< 0.08

The results of the path analysis model are illustrated in Figure 13. The path of personal involvement with sustainable technology readiness (γ = -0.24, t = -2.27, $p < 0.05$) was found to be negative and significant. The path of apparel technology knowledge with sustainable technology readiness (γ = 0.76, t = 8.10, $p < 0.001$) was positive and significant. The path of sustainable technology readiness with adoption intention (β = 0.12, t = 1.17, p = 0.243) was not found to be significant. The path of the relative advantage of sustainable technology with adoption intention (γ = 0.18, t = 2.29, $p < 0.05$) was found to be positive and significant. The path of facilitating conditions with adoption intention (γ = 0.16, t = 1.44, p = 0.151) was not significant. The path of social influence with adoption intention (γ = 0.42, t = 4.12, $p < 0.001$) was found to be positive and significant.

The hypotheses were tested on the relationships depicted in the structural model. Table 28 and Figure 13 present the hypothesized relationships of the model. The path coefficients of H2, H7, and H9 were found to be positive and significant; therefore, these three hypotheses are supported. The path coefficient of H1 was found significant but negative; therefore, the hypothesis was not supported. The path coefficients of H6 and H8 were not found to be significant; therefore, these hypotheses were also not supported. A detailed discussion of these hypotheses is presented in the next chapter.

Figure 13. Structural Model (Alternative Model 1)



Note. Coefficients are completely standardized.

The solid lines indicate that the path coefficients are significant and the hypotheses were supported.

The dashed lines indicate that the path coefficients are not significant and the hypotheses were not supported.

The dotted line indicates that the path coefficient is significant but negative; thus, the hypothesis was not supported.

* = $p < 0.05$, *** = $p < 0.001$.

Table 28. Hypotheses Testing from SEM Results (Alternative Model 1)

	Hypotheses	Standardized Path Coefficient	t-value	Supported?
1	Personal involvement-> Sustainable technology readiness	-0.24*	-2.27	No
2	Apparel technology knowledge-> Sustainable technology readiness	0.76***	8.10	Yes
6	Sustainable technology readiness->Adoption intention	0.12	1.17	No
7	Relative advantage of sustainable technology->Adoption intention	0.18*	2.29	Yes
8	Facilitating conditions->Adoption intention	0.16	1.44	No

9	Social influence->Adoption intention	0.42***	4.12	Yes

Note. * = $p < 0.05$, *** = $p < 0.001$.

Testing of Moderating Effects in Alternative Model 1

As knowledge of the impact of apparel production on the environment (KIA) was dropped in Alternative Model 1, H4c and H5c became invalid. As both the moderator variables, education and experience, are categorical variables, PROCESS v4 by Andrew F. Hayes was used to test the moderating relationships as stated in hypotheses H4a, H4b, H5a, and H5b (Hayes, 2012). PROCESS v4 was added as a plugin in the SPSS version 29.0.1.0. The moderator variable education had three levels: 1 = Having a master's degree or above; 2 = Having a bachelor's degree; and 3 = Not having a bachelor's degree. For the variable experience, there were also three levels: 1 = 2-5 years; 2 = 6-9 years; 3 = 10 or more years. As both the variables had three levels, the output of the PROCESS results (Hayes, 2012) provided two interaction variables for each of the hypotheses. None of the interactions were found significant; therefore, in none of the cases, a moderation effect was found. Therefore, hypotheses H4a, H4b, H5a, and H5b are not supported. The findings are reported in Table 29, along with the Standardized Beta Coefficient, T-value, and p-value. Findings are interpreted and discussed in the next chapter (Chapter V).

Table 29. Results of Testing Moderating Effects (Alternative Model 1)

H	Interaction/Moderator Variable	Standardized Beta Coefficient	T-value	p-value	Moderation Found	Hypotheses Supported?
4a	Education*PI (1)	0.09	0.69	.49	No	No
	Education*PI (2)	0.26	0.81	.42	No	No
4b	Education*ATK (1)	-0.22	-1.36	.18	No	No
	Education*ATK (2)	0.25	0.73	.47	No	No
5a	Experience*PI (1)	0.20	1.16	.25	No	No
	Experience*PI (2)	0.35	1.07	.28	No	No
5b	Experience*ATK (1)	0.27	1.22	.22	No	No
	Experience*ATK (2)	0.13	0.62	.54	No	No

Alternative Model 2

Measurement Model Analysis of Alternative Model 2

Fit Indices of Alternative Model 2

Confirmatory Factor Analysis (CFA) of the measurement model of the alternative model 2 was conducted. The results of the fit statistics are reported in Table 30. The Chi-square statistic is found significant ($\chi 2$ = 704.620, df = 329, p < 0.00001). As the Chi-square statistic is very sensitive to sample size, it may be misleading to make a decision based on Chi-square statistics only (Hair et al., 2015; Hu & Bentler, 1999). Thus, the Normed Chi-square could be a more suitable measure (Hair et al., 2015; Hu & Bentler, 1999). In this alternative model 2, the Normed Chi-square was found to be 2.14, below the cutoff level of 5, as suggested by Hu and Bentler (1999). The SRMR (standardized root mean square) value was 0.06, which is also lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). The CFI (comparative fit index) value was 0.88, which is slightly less than the suggested cutoff level of 0.9. The RMSEA (root mean square error of approximation) value was 0.07, which is lesser than the suggested cutoff level of 0.08, indicating an acceptable fit of the model (Hu & Bentler, 1999). It is clear from the fit statistics of Alternative Model 2 that the measurement model overall exhibits adequate and acceptable levels of fit.

Table 30. Summary of the Measurement Model Goodness of Fit (Alternative Model 2)

Fit Type	Fit Measure	Fit Guideline Criteria	Proposed Model	Acceptance
Absolute fit	Chi-square	p > 0.05	p < 0.001	No
	Normed Chi-square (χ2/degree of freedom)	2-5	2.14	Yes
	Standardized root mean square residual (SRMR)	<0.08	.06	Yes
Incremental fit	Comparative fit index (CFI)	>0.90	.88	No
Parsimonious fit	Root mean square error of approximation (RMSEA)	<0.08	.07	Yes

Note. Source: Hu and Bentler (1999).

Evaluation of Parameter Estimates of Alternative Model 2

Table 31 reports the unstandardized factor loading, t-statistics, and completely standardized factor loadings. For Personal Involvement (PI) construct, standardized factor loadings ranged from 0.65 to 0.86. For Knowledge of the Impact of Apparel Production on the Environment (KIA) construct, factor loadings ranged from 0.65 to 0.86. For Sustainable Technology Readiness (STR), factor loadings ranged from 0.66 to 0.72. For Relative Advantage (RA), factor loadings ranged from 0.68 to 0.91. For Facilitating Conditions (FC), factor loadings ranged from 0.67 to 0.85. For Social Influence (SI), factor loadings ranged from 0.68 to 0.86. Factor loadings ranged from 0.65 to 0.71 for the Adoption Intention (AI) construct.

Table 31. Results of the Measurement Model: Factor Loadings and t-statistics (Alternative Model 2)

Constructs	Items	Unstandardized Factor Loading	t-statistics	Completely Standardized Factor Loading (λ)
Personal Involvement (PI)	PI1	1.00		0.73
	PI2	0.77	9.67	0.74
	PI3	0.82	10.46	0.86
	PI4	1.00	9.24	0.65
Knowledge of the Impact of Apparel Production on the Environment (KIA)	KIA2	1.00		0.65
	KIA3	1.04	8.68	0.68
	KIA4	1.46	9.26	0.86
	KIA5	1.36	9.20	0.80
Sustainable Technology Readiness (STR)	STRO4	1.00		0.69
	STRO6	0.92	9.11	0.66
	STRINV4	1.22	6.94	0.72
	STRINV5	1.38	6.56	0.71
Relative Advantage (RA)	RA2	1.00		0.72
	RA3	1.32	12.12	0.85
	RA4	1.29	12.45	0.91
	RA5	1.15	9.66	0.68
Facilitating Condition (FC)	FC1	1.00		0.81
	FC2	0.93	13.92	0.85
	FC3	0.60	10.08	0.67

	FC4	0.78	10.65	0.70
Social Influence (SI)	SI1	1.00		0.82
	SI2	1.12	14.90	0.86
	SI3	1.06	14.73	0.86
	SI4	0.79	10.63	0.68
Adoption Intention (AI)	AI1	1.00		0.66
	AI2	1.13	8.20	0.65
	AI3	1.46	7.69	0.71
	AI4	1.47	7.27	0.66

Note. 1. λ (Lambda): Completely Standardized Factor Loading Value. The first λ path of each construct was set to 1; therefore, the t-value was not reported.

2. All factor loadings were significant at $p < 0.001$.

Figure 14 is the measurement model diagram (Alternative Model 2) containing the indicator variables and the latent constructs with the results of unstandardized parameter estimates. Figure 15 presents the measurement model (Alternative Model 2) with completely standardized parameter estimates. All path parameter estimates' p-values are less than 0.05, making them all statistically significant ($p < 0.05$). According to the CFA results of the alternative model, the indicators for each construct were statistically significant and all the factor loadings are greater than 0.5; thus, the indicators are adequate for measuring the study constructs (Hair et al., 2011; Kline, 2016; Raykov & Marocoulides, 2006).

Figure 14. Measurement Model with Unstandardized Parameter Estimates (Alternative Model 2)

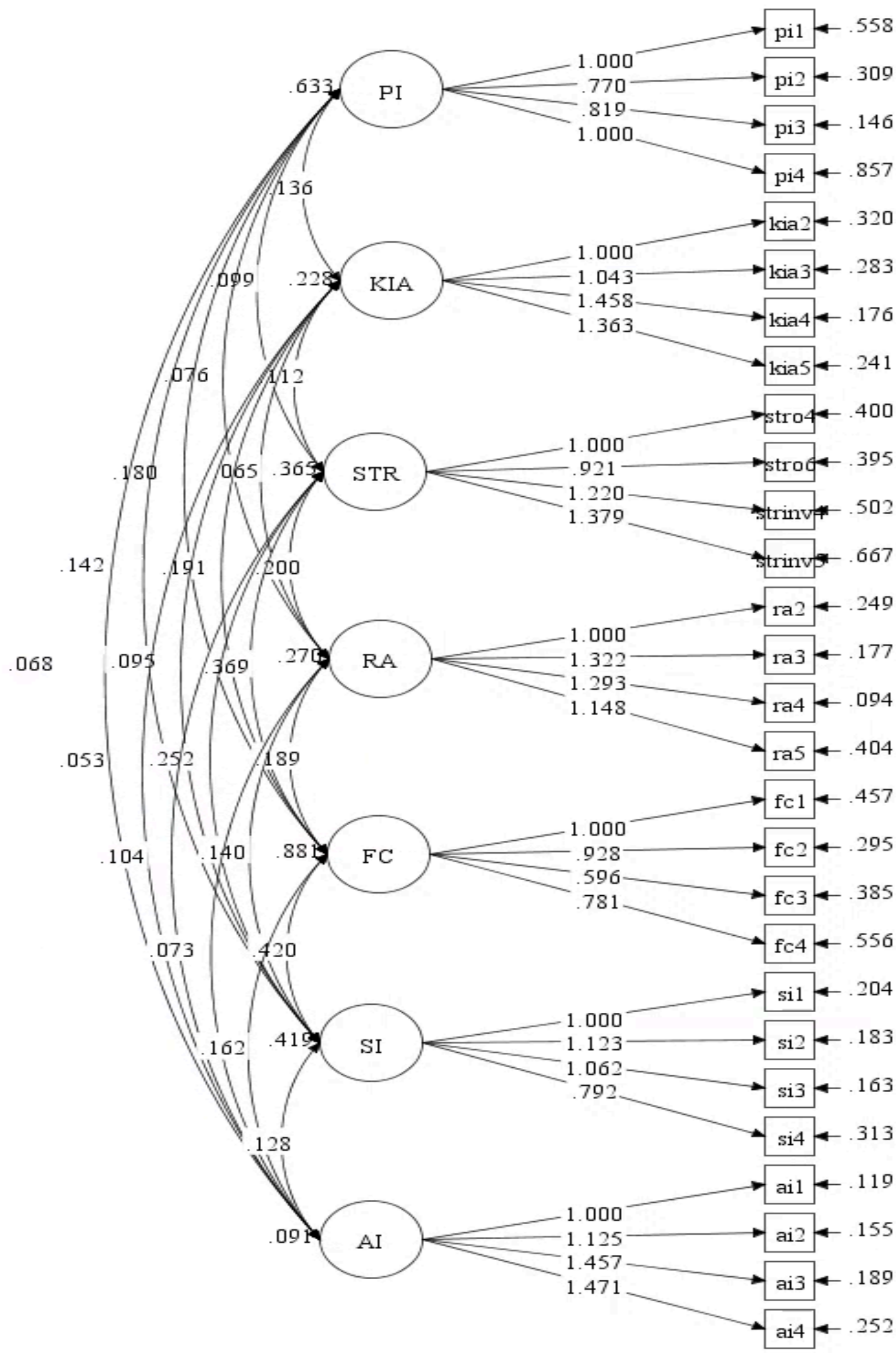
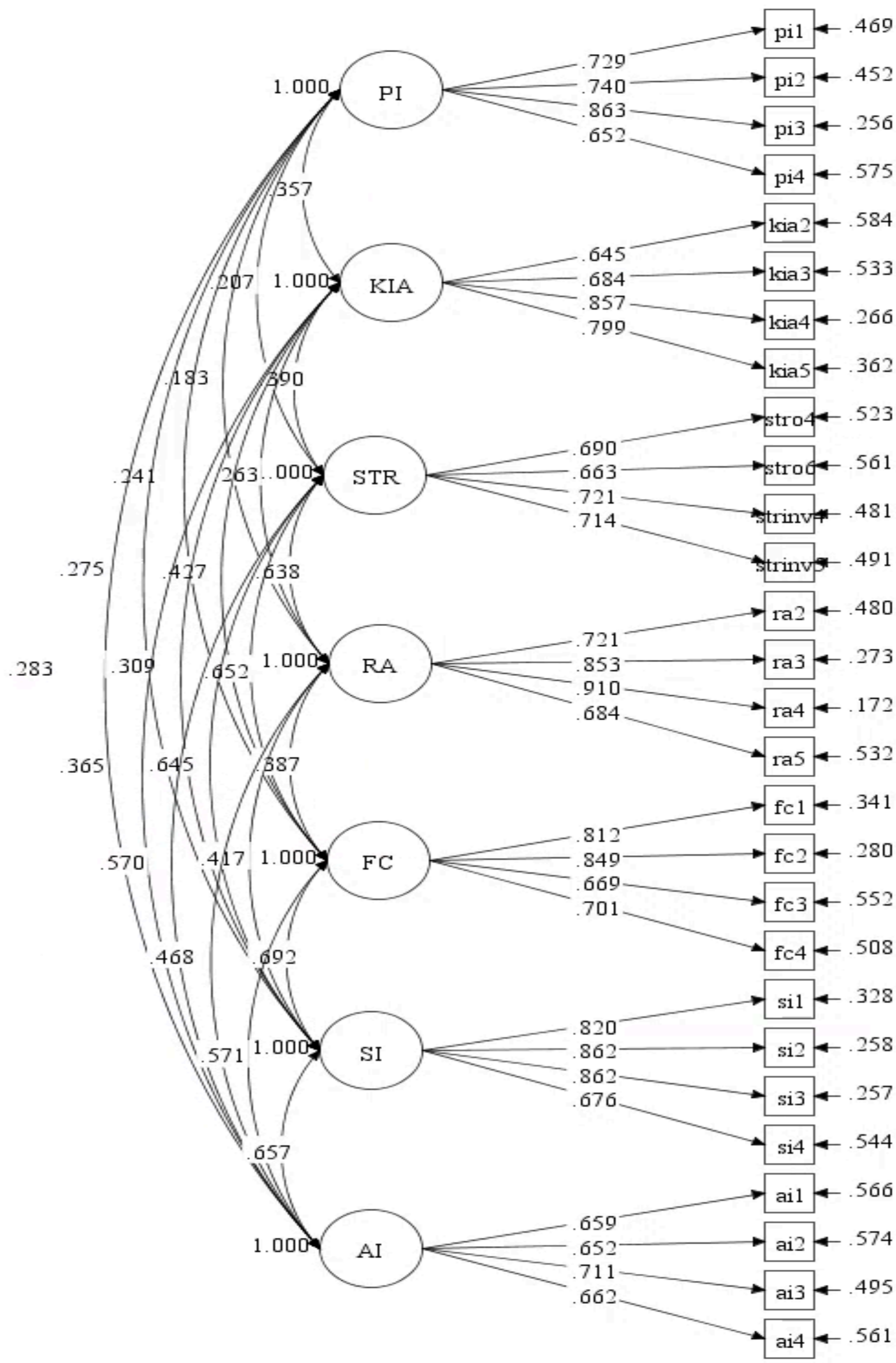


Figure 15. Measurement Model with Standardized Parameter Estimates (Alternative Model 2)



Evaluation of Psychometric Properties of Alternative Model 2

Reliability. Table 32 presents the psychometric properties of the measurement model of Alternative Model 2, which were used to evaluate the validity and reliability of the measurement model. The composite reliability coefficients of the constructs varied from 0.77 to 0.88, indicating high composite reliability (acceptable if greater than 0.7) in measuring the underlying latent constructs (Kline, 2016). Table 32 also reported the values of Cronbach's alpha (α). Cronbach's alpha coefficients ranged from 0.76 to 0.88, indicating the scale items' acceptable internal reliability.

Table 32. Measurement Reliability and Validity (Alternative Model 2)

Constructs	Items	Standardized Factor Loading (λ)	Composite Reliability (CR)	Cronbach's α	Average Variance Extracted (AVE)
Personal Involvement (PI)			0.84	0.81	0.56
	PI1	0.73			
	PI2	0.74			
	PI3	0.86			
	PI4	0.65			
Knowledge of the Impact of Apparel Production on the Environment (KIA)			0.84	0.83	0.57
	KIA2	0.65			
	KIA3	0.68			
	KIA4	0.86			
	KIA5	0.80			
Sustainable Technology Readiness (STR)			0.79	0.78	0.48
	STRO4	0.69			
	STRO6	0.66			
	STRINV4	0.72			
	STRINV5	0.71			
Relative Advantage (RA)			0.87	0.86	0.63
	RA2	0.72			
	RA3	0.85			
	RA4	0.91			
	RA5	0.68			
Facilitating Condition (FC)			0.85	0.84	0.58
	FC1	0.81			
	FC2	0.85			
	FC3	0.67			

	FC4	0.70			
Social Influence			0.88	0.88	0.65
(SI)	SI1	0.82			
	SI2	0.86			
	SI3	0.86			
	SI4	0.68			
Adoption Intention			0.77	0.76	0.45
(AI)	AI1	0.66			
	AI2	0.65			
	AI3	0.71			
	AI4	0.66			

Validity. The measurement model's (alternative model 2) standardized factor loadings ranged from 0.65 to 0.91, and all were above Hair et al. (2015)'s suggested threshold of 0.5. The values of composite reliability (CR) varied from 0.77 to 0.88, which indicated that the scale items presented high internal consistency for the constructs (Hair et al., 2015). As reported in Table 32, AVE values ranged from 0.45 to 0.65. Two AVE values are slightly lower than 0.5. According to Hulland (1999), the AVE values are considered acceptable as the values of square root of AVEs varied from 0.67 to 0.81 and all the correlation coefficients between the constructs were less than the square root of AVEs (Table 33). In addition, as presented in Table 33, none of the correlations between the factors are more than 0.8; therefore, discriminant validity was achieved, as suggested by Hair et al. (2015). In agreement with the SEM literature (Hair et al., 2015; Kline, 2016), the results of measurement model fit, reliability, and validity were deemed satisfactory to proceed to structural regression model analysis of Alternative Model 2.

Table 33. Correlation Matrix of the Latent Constructs (Alternative Model 2)

Construct	Mean	SD	Correlations						
			PI	KIA	STR	RA	FC	SI	AI
PI	4.35	0.80	**0.75**						
KIA	4.44	0.64	0.36**	**0.75**					
STR	4.17	0.77	0.21*	0.39**	**0.69**				
RA	4.51	0.66	0.18*	0.26**	0.64**	**0.79**			
FC	3.99	0.84	0.24*	0.43**	0.65**	0.39**	**0.76**		
SI	4.35	0.69	0.28**	0.31**	0.65**	0.42**	0.69**	**0.81**	
AI	4.65	0.44	0.28**	0.37**	0.57**	0.47**	0.57**	0.66**	**0.67**

Note. The diagonal values (bold) are the square root of the AVE (average variance extracted) for each construct.

PI = Personal Involvement; KIA = Knowledge of the Impact of Apparel Production on the Environment; STR = Sustainable Technology Readiness; RA = Relative Advantage; FC = Facilitating Conditions; SI = Social Influence; AI = Adoption Intention.

* = $p < 0.01$, **= $p < 0.001$.

Structural Model Analysis of Alternative Model 2

Table 34 reported the fit statistics of the structural model of the alternative model 2. Normed Chi-square and RMSEA were found satisfactory. SRMR (0.1) and the Comparative fit index (CFI) (0.85) were close to the recommended criteria. Thus, the structural model was deemed to have an acceptable fit, and it was appropriate to move forward to check the hypothesized relationships in the model (Kline, 2016; Raykov & Marocoulides, 2006).

Table 34. Fit Indices of the Structural Model (Alternative Model 2)

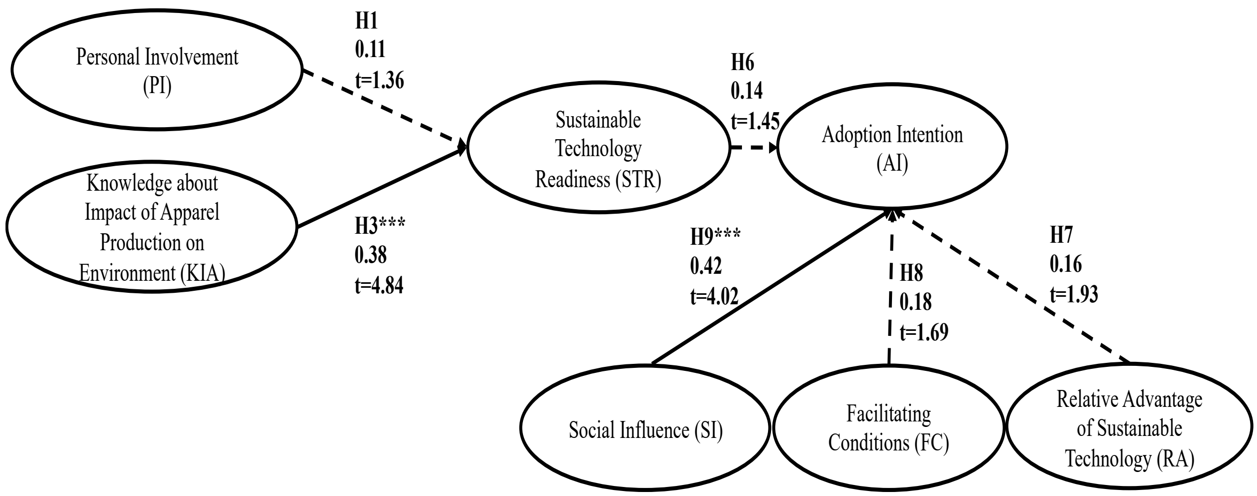
Measures	Value	Recommended Value
Chi-square	$p < 0.001$	$p > 0.05$
Normed Chi-square ($\chi2$/degree of freedom)	2.43	< 5
Standardized root mean squared residual (SRMR)	0.11	< 0.08
Comparative fit index (CFI)	0.85	> 0.90

Root mean square error of approximation (RMSEA)	0.08	< 0.08

The results of the path analysis model are illustrated in Figure 16. The path of personal involvement with sustainable technology readiness ($\gamma = 0.11$, $t = 1.36$, $p = 0.18$) was not found to be significant. The path of knowledge of the impact of apparel production on the environment with sustainable technology readiness ($\gamma = 0.38$, $t = 4.84$, $p < 0.001$) was positive and significant. The path of sustainable technology readiness with adoption intention ($\beta = 0.14$, $t = 1.45$, $p = 0.15$) was not found to be significant. The path of the relative advantage of sustainable technology with adoption intention ($\gamma = 0.16$, $t = 1.93$, $p = 0.054$) was not found to be significant. The path of facilitating conditions with adoption intention ($\gamma = 0.18$, $t = 1.69$, $p = 0.09$) was not significant. The path of social influence with adoption intention ($\gamma = 0.42$, $t = 4.02$, $p < 0.001$) was found to be positive and significant.

The hypotheses were tested on the relationships depicted in the structural model. Table 35 and Figure 16 present the hypothesized relationships of the model. The path coefficients of H3 and H9 were found to be positive and significant; therefore, these two hypotheses are supported. The path coefficients of H1, H6, H7, and H8 were not found to be significant, therefore, these hypotheses were also not supported.

Figure 16. Structural Model (Alternative Model 2)



Note. Coefficients are completely standardized.

Solid lines indicate that the path coefficients are significant and the hypotheses were supported. Dashed lines indicate that the path coefficients are not significant and the hypotheses are not supported.

*** = $p < 0.001$.

Table 35. Hypotheses Testing from SEM Results (Alternative Model 2)

	Hypotheses	Standardized Path Coefficient	T-value	Supported?
1	Personal involvement-> Sustainable technology readiness	0.11	1.36	No
3	Knowledge of the impact of apparel production on the environment-> Sustainable technology readiness	0.38***	4.84	Yes
6	Sustainable technology readiness->Adoption intention	0.14	1.45	No
7	Relative advantage of sustainable technology->Adoption intention	0.16	1.93	No
8	Facilitating conditions->Adoption intention	0.18	1.69	No
9	Social influence->Adoption intention	0.42***	4.02	Yes

Note. *** = $p < 0.001$.

Testing of the Moderating Effects in Alternative Model 2

As Apparel Technology Knowledge (ATK) was dropped in the alternative model, H4b and H5b became invalid. As both the moderator variables, education and experience are categorical variables, PROCESS v4 by Andrew F. Hayes was used to test the moderating relationships as stated in hypotheses H4a, H4c, H5a, and H5c (Hayes, 2012). PROCESS v4 was added as a plugin in the SPSS version 29.0.1.0. The moderator variable education had three levels: 1 = Having a master's degree or above; 2 = Having a bachelor's degree; and 3 = Not having a bachelor's degree. For the variable experience, there were also three levels: 1 = 2-5 years; 2 = 6-9 years; 3 = 10 or more years. As both the variables had three levels, the output of the PROCESS results (Hayes, 2012) provided two interaction variables for each of the hypotheses. None of the interactions were found significant; therefore, in none of the cases, a moderation effect was found. Therefore, hypotheses H4a, H4c, H5a, and H5c were not supported. The findings are reported in Table 36, along with the Standardized Beta Coefficients, t-values, and p-values. Findings are interpreted and discussed in the next chapter (Chapter V).

Table 36. Results of Testing Moderating Effects (Alternative Model 2)

H	Interaction/Moderator Variable	Standardized Beta Coefficient	T-value	p-value	Moderation Found	Hypotheses Supported?
4a	Education*PI (1)	0.09	0.69	0.49	No	No
	Education*PI (2)	0.26	0.81	0.42	No	No
4c	Education*KIA (1)	-0.17	-0.90	0.37	No	No
	Education*KIA (2)	-0.16	-0.39	0.70	No	No
5a	Experience*PI (1)	0.20	1.16	0.25	No	No
	Experience*PI (2)	0.35	1.07	0.28	No	No
5c	Experience*KIA (1)	0.07	0.27	0.78	No	No
	Experience*KIA (2)	-0.02	-0.11	0.91	No	No

Summary

Chapter IV explains the data collection procedures, presents the results of survey data analysis and preliminary data analysis, including the description of the sample responses, analysis results of non-response bias and common method bias, and provides the measurement and structural model analyses for the original model and the two alternative models. Hypothesized relationships in the structural model were tested, and findings were reported. In the next chapter, the results of the hypothesis testing are discussed in relation to the objectives and purpose of the dissertation, and the theoretical and managerial implications are provided. The next chapter also contains conclusions, future research directions, and a summary of the study's limitations.

CHAPTER V: CONCLUSIONS

Chapter V functions as the conclusion to this dissertation and comprises the following six sections: (1) Discussion of Alternative Model 1; (2) Discussion of Alternative Model 2; (3) Conclusions; (4) Implications; (5) Limitations; and (6) Recommendations for Future Research.

The first two sections present a thorough discussion of the results found from the data analysis, and then the conclusions of this dissertation are provided. The fourth section discusses the theoretical and managerial implications of this study. The fifth section states the limitations of this study. The sixth section presents future research recommendations.

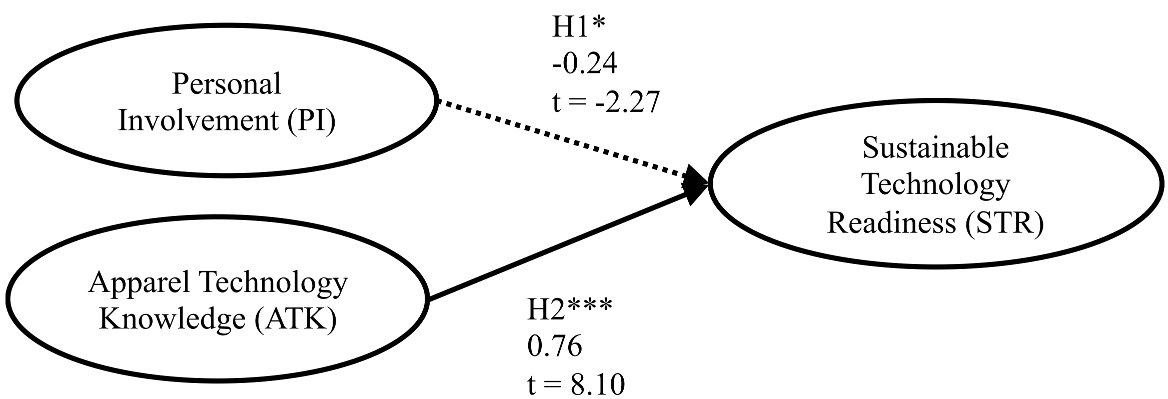
Discussion of Alternative Model 1

This dissertation aimed to investigate the factors affecting the adoption intention of apparel firm managers toward sustainable technology. The study also intended to understand the antecedents influencing apparel managers' readiness toward sustainable technology in the context of the Bangladesh apparel industry. To address these purposes, three specific objectives guided this dissertation research: (1) to investigate the relationships between managers' knowledge and involvement in technology and their readiness toward sustainable technology; (2) to examine the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness; (3) to investigate how apparel managers' sustainable technology readiness, their perceptions of social influences, facilitating conditions, and relative advantage of sustainable technology impact their intention to adopt sustainable technology. Guided by the objectives and the theoretical framework of this study, the following paragraphs discuss the results of the hypotheses testing of the alternative model as presented in the previous chapter.

Objective 1

As knowledge of the impact of apparel production on the environment (KIA) is dropped from the alternative model 1, H3 becomes invalid. To investigate the relationships of apparel managers' personal involvement in technology and their knowledge of apparel technology with sustainable technology readiness, H1 and H2 were tested, and the results are shown in Figure 17. Findings were interpreted and discussed in light of the theoretical framework of this study, as discussed in Chapter II.

Figure 17. Relationships of Knowledge and Involvement with Sustainable Technology Readiness (Alternative Model 1)



Note. The solid line represents a significant relationship, and the hypothesis is supported. The dotted line represents a significant relationship but is negative; therefore, the hypothesis is not supported. The coefficients presented are standardized path coefficients. * = $p < 0.05$, *** = $p < 0.001$

Relationship between Personal Involvement in Technology and Sustainable Technology Readiness

H1 stated that apparel firm managers' personal involvement in technology positively affects their sustainable technology readiness. As illustrated in Figure 17, the path in the model between personal involvement and sustainable technology readiness was found significant at $p < 0.05$ ($\gamma = -0.24$, $t = -2.27$), but the direction of the relationship was negative. Therefore, no evidence in the data supports the relationship proposed in the first hypothesis. This result did not meet the expectation that there is a positive relationship between personal involvement in technology and sustainable technology readiness, as supported by previous studies (Celik & Kocaman, 2017; Turan et al., 2015).

For the unexpected relationship result, it can be interpreted as apparel firm managers' personal involvement in technology significantly influencing their sustainable technology readiness in a reverse direction. That means apparel managers with a high level of involvement in technology will possess a lower level of readiness toward sustainable technology. This finding does not comply with the study of Celik and Kocaman (2017) and Turan et al. (2015). It can be possible that there are managers with high involvement in technology but low knowledge of sustainability. Managers' involvement in technologies is a critical facet of the diffusion of innovation in the industry. Managers considered highly involved in technological trends show positive attitudes toward technological products and services, providing them with some social recognition (Rogers, 1983, 1995). As technology readiness has been considered a factor that fosters new technology adoption, individuals' personal involvement in technology may influence their technology readiness (Agarwal & Prasad, 1998b; Parasuraman, 2000). This dissertation posited a unique context of technology readiness with a sustainability background, termed sustainable technology readiness. The reason behind not supporting this hypothesis may be the reason of comparatively less engagement of the managers with sustainable technologies in their daily life compared with general technologies. In the Bangladeshi apparel industry context, managers being more involved in technology may become more concerned about implementation policy, top management's thoughts, and technology investment, which in turn may make them less optimistic about adopting sustainable technologies. This might be a reason for this significant and negative relationship between personal involvement and sustainable technology adoption.

Relationship between Apparel Technology Knowledge and Sustainable Technology Readiness

H2 proposed that apparel firm managers' apparel technology knowledge positively affects their sustainable technology readiness. This relationship was found to be positive and significant. The path in the model between apparel technology knowledge and sustainable technology adoption was positive and significant at $p < 0.001$ ($\gamma = 0.76$, $t = 8.10$). Therefore, data support the relationship proposed in the second hypothesis. The findings met the expectation that there is a positive and significant relationship between apparel technology knowledge and sustainable technology readiness.

As H2 is supported, it means apparel managers with a high knowledge of apparel technology will have a higher readiness level toward sustainable technology. Within the context of the apparel industry, some recent studies described that knowledge about the latest apparel technology could be considered one of the important skills of apparel firm managers (Iqbal et al., 2022; Jacobs & Karpova, 2020). Knowledge of the latest apparel technology helps managers understand the impact of those technologies on manufacturing (Kang et al., 2013). Apparel managers who are knowledgeable about modern apparel manufacturing technologies and the benefits of using these technologies in apparel firms can be more optimistic (Celik & Kocaman, 2017; Parasuraman, 2000; Qasem, 2021) about the technologies that help the firms in sustainable manufacturing (Koo & Chung, 2014; Wang et al., 2017). Moreover, Brockman and Morgan (2003) found that knowledge impacts individuals' innovativeness. Rodan and Galunic (2004) also suggested that managers' knowledge significantly affects their innovativeness. As optimism and innovativeness are the core component of technology readiness in this study, the significant finding regarding the impact of apparel technology knowledge on sustainable technology readiness complies with existing literature. The underlying reason for supporting H2 may be the fact that almost 80% of the respondents had higher education in STEM. The findings indicate that the managers with more knowledge about apparel technology, the more confident and optimistic about using technology to solve apparel sustainability problems and the more capable and innovative in using sustainable technologies, and thus they have a more favorable attitude toward sustainable tech.

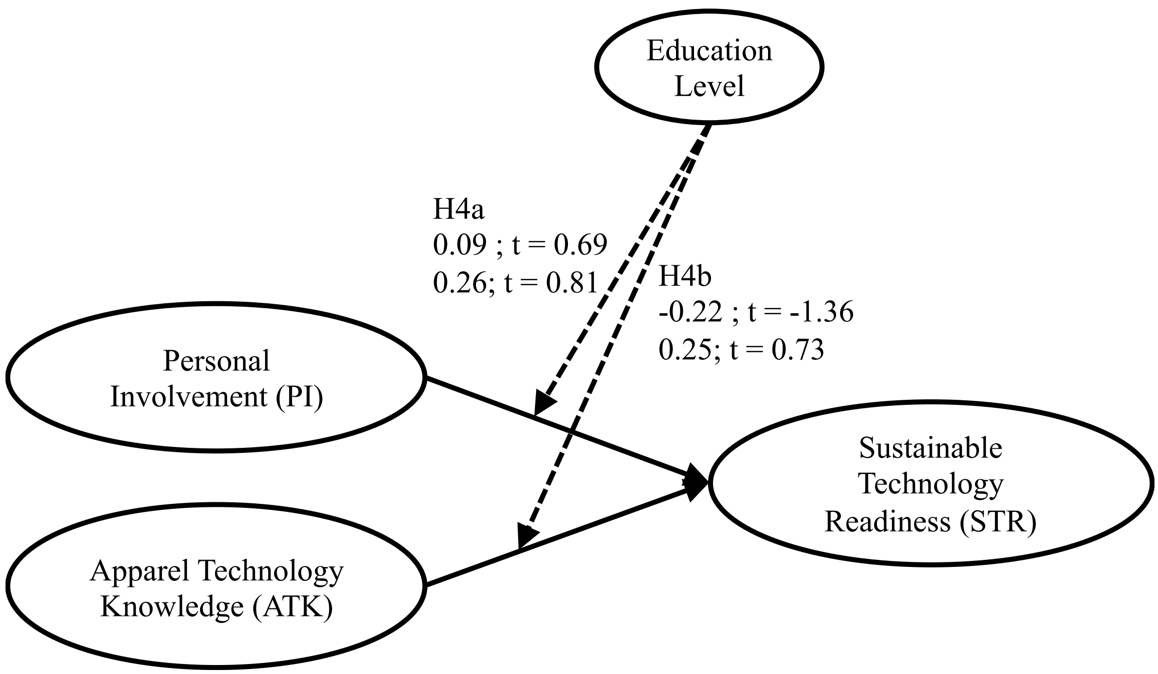
Objective 2

For investigating the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness, H4a, H4b, H5a, and H5b were tested using PROCESS v4 by Andrew F. Hayes (Hayes, 2012). For the variable education, there were three levels: (1) Having a master's degree or above; (2) Having a bachelor's degree; and (3) Not having a bachelor's degree. For the variable experience, there were also three levels: (1) 2-5 years; (2) 6-9 years; (3) 10 or more years. Findings are interpreted and discussed in the following paragraphs.

Moderating Role of Education in the Relationships between Managers' Knowledge and Involvement and their Sustainable Technology Readiness

H4a proposed that apparel managers' education level moderates the relationship between their personal involvement and sustainable technology readiness. The analysis results show that no moderating effect was found. H4b stated that apparel managers' education level moderates the relationship between their apparel technology knowledge and sustainable technology readiness. The results indicate no moderating effect of education level. Figure 18 presents the results of testing the moderating effect of education level on the relationships of personal involvement and apparel technology knowledge with sustainable technology readiness.

Figure 18. Results of the Moderating Role of Education Level (Alternative Model 1)



Note. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized beta coefficients ($p < 0.05$) as moderator variables received from PROCESS v4 output.

As Education had three levels, for H4a, there were two standardized beta coefficients of the moderator variable in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = 0.09$, $t = 0.69$; $Beta_2 = 0.26$, $t = 0.81$). Therefore, there is not enough statistically significant evidence to support H4a. The findings did not support the hypotheses that education level moderates the relationship between managers' personal involvement and their sustainable technology readiness. The correlation between personal involvement and education was checked and was not significant (Pearson correlation coefficient = -0.11, $p = 0.09$).

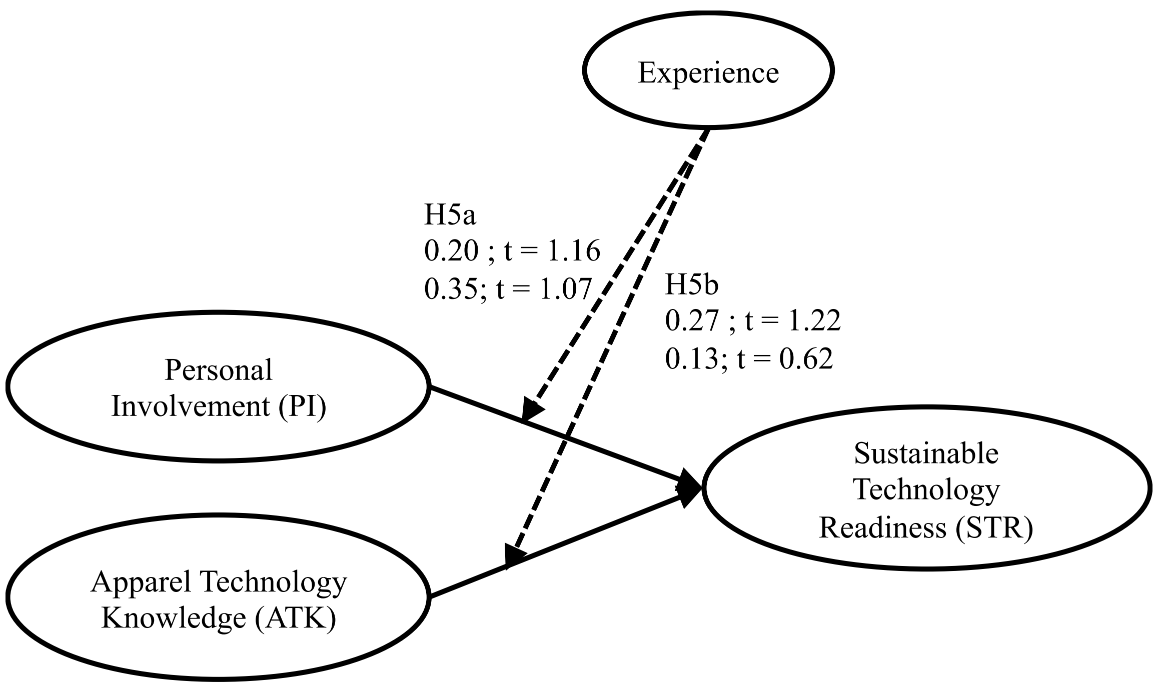
For H4b, based on the two standardized beta coefficients of the moderator variable shown in PROCESS v4 output, neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = -0.22$, $t = -1.36$; $Beta_2 = 0.25$, $t = 0.73$). Therefore, there is not enough statistically significant evidence to support H4b. The findings did not support the hypothesis that education level moderates the relationship between managers' knowledge of apparel technology and their sustainable technology readiness. The correlation between knowledge of apparel technology and education was checked and was found to be significant (Pearson correlation coefficient = -0.18, $p < 0.001$). This strong correlation between knowledge of apparel technology and education might be a reason for not supporting this hypothesis.

It is seen from the demographic characteristics of the sample that only 3.2% of the respondents do not have a bachelor's degree, while 34.4% of them have a master's degree or above, and 62.4% of them have a bachelor's degree. The underlying reason for not having the H4a and H4b unsupported is that perhaps there is a little difference in knowledge and involvement between the bachelor's degree holder and the master's degree holder managers in apparel firms.

Moderating Role of Experience in the Relationships between Managers' Knowledge and Involvement and Their Sustainable Technology Readiness

H5a stated that apparel managers' working experience moderates the relationship between their personal involvement in technology and sustainable technology readiness. The analysis results show that no moderating effect was found. H5b proposed that apparel managers' working experience moderates the relationship between their apparel technology knowledge and sustainable technology readiness. The results indicate no moderating effect of working experience. Figure 19 presents the results of testing the moderating effect of working experience on the relationships of personal involvement and apparel technology knowledge with sustainable technology readiness.

Figure 19. Results of the Moderating Role of Working Experience (Alternative Model 1)



Note. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized beta coefficients (p < 0.05) as moderator variables received from PROCESS v4 output.

As Experience had three levels, for H5a, there were two standardized beta coefficients of the moderator variable found in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = 0.20$, $t = 1.16$; $Beta_2 = 0.35$, $t = 1.07$). Therefore, there is not enough statistically significant evidence to support H5a. The findings did not support the hypothesis that working experience moderates the relationship between managers' personal involvement and their sustainable technology readiness. The correlation between personal involvement and working experience was checked and was found significant (Pearson correlation coefficient = 0.25, $p < 0.001$).

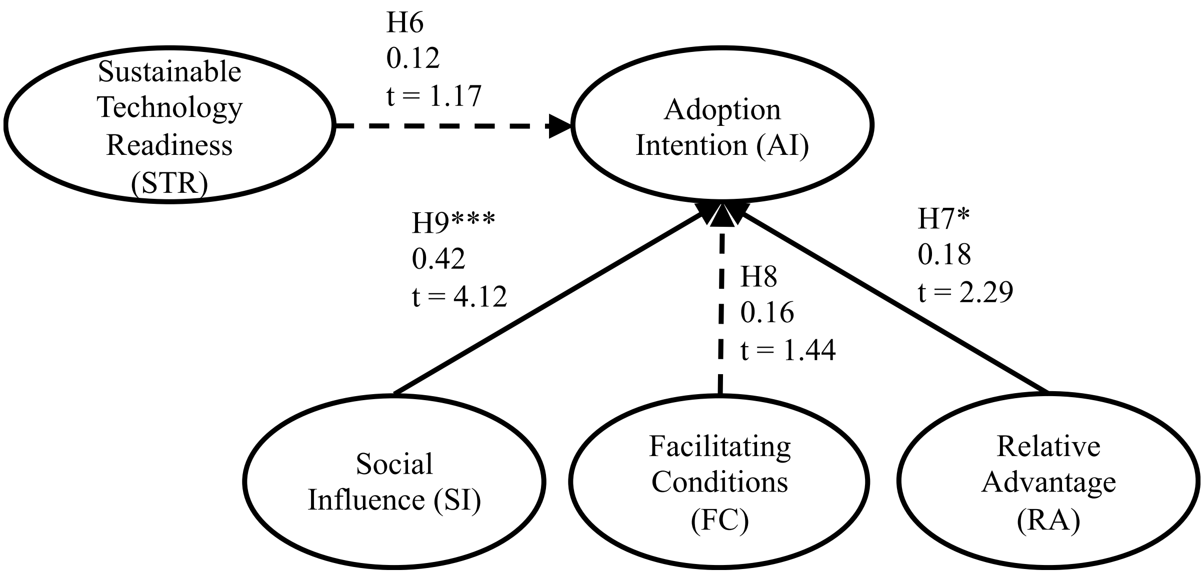
For H5b, two standardized beta coefficients of the moderator variable were found in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = 0.27$, $t = 1.22$; $Beta_2 = 0.13$, $t = 0.62$). Therefore, there is not enough statistically significant evidence to support H5b. The findings did not support the hypothesis that working experience moderates the relationship between managers' knowledge of apparel technology and their sustainable technology readiness. The correlation between knowledge of apparel technology and experience was checked and was not found to be significant (Pearson correlation coefficient = 0.09, $p = 0.168$).

It is seen from the demographic characteristics of the sample that 62.9% of the respondents had experience of less than 6 years in the apparel industry. It is possible that the apparel mangers had less opportunity to improve their knowledge and involvement with technology while they are on the job. Maybe a lack of on-the-job training and learning opportunity has influence on the findings of the result.

Objective 3

To investigate the relationships of apparel managers' sustainable technology readiness and their perceptions of social influences, facilitating conditions, and relative advantage of sustainable technology with their intention to adopt sustainable technology, H6, H7, H8, and H9 were tested. Figure 20 presents the results of hypothesis testing of H6, H7, H8, and H9. Results were interpreted and discussed in light of the theoretical framework of this study, as discussed in Chapter II.

Figure 20. Relationships of Sustainable Technology Readiness, Social Influences, Facilitating Conditions, and Relative Advantage with Adoption Intention (Alternative Model 1)



Note. The solid line represents a significant relationship, and the hypothesis is supported. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized path coefficients.

* = $p < 0.05$, *** = $p < 0.001$

Relationship between Sustainable Technology Readiness and Adoption Intention

H6 proposes that apparel managers' sustainable technology readiness positively affects their intention to adopt sustainable technology. As illustrated in Figure 17, this relationship was not found to be significant. The path between sustainable technology readiness and adoption intention of sustainable technology was found to be nonsignificant at $p < 0.05$ ($\beta = 0.12$, $t = 1.17$). Therefore, there is not enough statistically significant evidence to support the relationship proposed in H6 (the relationship between sustainable technology readiness and adoption intention). That means apparel managers with a high level of sustainable technology readiness may not possess a high level of intention to adopt sustainable technology.

As previous studies did not hypothesize and test the relationship between technology readiness and adoption intention in the context of sustainability, this insignificance could not be compared with the results of previous studies. Previous researchers indicated that individuals' technology readiness positively impacts their actual adoption behavior (Reynolds et al., 2020; Zeithaml et al., 2002). According to the DOI theory, people's willingness to adopt technologies is associated with their attitude toward any change (Rogers, 1995). As technology readiness is conceptualized as an overall attitude of a person toward a technology (Stanford et al., 2009), DOI is a suitable theory to explain the relationship between technology readiness and adoption intention. Reynolds et al. (2020) found that top management's technology readiness positively impacts technology adoption in small businesses. Pradhan et al. (2018) found a significant impact of technology readiness on travelers' usage intentions of smart devices. Kamble et al. (2019) found technology readiness as a significant predictor of intention to use blockchain technology in the Indian supply chain context. Elliott et al. (2013) investigated the intention of consumers to use self-scanning technology and found that consumers' technology readiness plays a significant and positive role in influencing their intention to use self-scanning technology. Kim and Chiu (2019) examined consumers' acceptance of wearable sports technology, and their findings showed that technology readiness significantly impacts the intention of consumers to use wearable sports technology. Verma and Chaurasia (2019) also found technology readiness as one of the determinants of intention to adopt big data in a firm. In the context of e-fashion retailing, Qasem (2021) found a significant effect of individuals' technology readiness (optimism and innovativeness) on their virtual try-on technology adoption. But the findings of this study do not comply with the findings of the abovementioned studies.

The insignificant result of H6 could be explained as an attitude-behavior gap. It is possible that managers with a high level of sustainable technology readiness may not possess a high level of adoption intention of sustainable technology because of the influence of other variables that are not included in the model. For example, the technology investment policy of the firm may influence this relationship. The size of the firm and top management's perspective may also influence this relationship. Many technology adoption decisions are made by the top management of apparel firms, influenced by foreign buyers and retailers (Iqbal & Su, 2021). Because of the difference in power dynamics between manufacturer and retailer, this power difference may also influence the relationship between managers' sustainable technology readiness and their intention to adopt sustainable technology.

Relationship between Relative Advantage and Adoption Intention

H7 stated that apparel managers' perceived relative advantage of sustainable technology positively affects their intention to adopt sustainable technology. This relationship was found to be positive and significant. The path in the model between relative advantage and adoption intention of sustainable technology was found to be positive and significant at $p < 0.05$ ($\gamma = 0.18$, $t = 2.29$). Therefore, there exists strong statistical evidence in the data to support the relationship proposed in H7 (the relationship between the relative advantage of sustainable technology and adoption intention). Apparel firm managers' perception of relative advantage significantly and positively influences their intention to adopt sustainable technology. Apparel managers with a higher perceived level of relative advantage will have a higher intention to adopt sustainable technology, which complies with several previous studies which were conducted based on the diffusion of innovation (DOI) theory (Nath et al., 2022; Ramayah et al., 2013; Rogers, 1995).

Relative advantage has regularly been used in the technology adoption literature, especially when the researcher intends to explain the research findings in the light of the diffusion of innovation (DOI) theory (Chong et al., 2009; Nath et al., 2022; Ramayah et al., 2013; Rogers, 1995). Previous studies consistently supported a positive relationship between technology adoption and relative advantage (Agarwal & Prasad., 1997; Chong et al., 2009; Ramayah et al., 2013; Tornatzky & Klein, 1982). Some recent studies also found relative advantage as a significant factor in the intention to use a particular technology in various contexts.

The existing literature lacks an investigation of the relationship between relative advantage and intention to adopt sustainable technology. According to Ullah et al. (2021), the relative advantage is a significant determinant of the intention to use blockchain technology in the context of e-learning. The study by Wong et al. (2020) found a similar relationship between relative advantage and adoption intention of blockchain technology for supply chain and operations management among SMEs. In the apparel supply chain context, Nath et al. (2022) investigated the factors influencing the adoption intention of blockchain technology. Their findings revealed that relative advantage significantly and positively impacts the adoption intention of blockchain technology (Nath et al., 2022).

It is understandable from the data that the apparel managers of Bangladesh started understanding the value of technology as an essential tool to address sustainability issues (For relative advantage, $M = 4.51$, $SD = 0.66$; for adoption intention, $M = 4.65$, $SD = 0.44$). It is also possible that apparel firms in Bangladesh started taking sustainability into serious consideration for their business improvement, and thus apparel managers explore the advantages of sustainability-related technology, which in turn impacts their intention to adopt those technologies at their firm. When apparel managers perceive the advantages of sustainable technologies over the existing ones in terms of reduction of waste, energy, and water consumption, they may have a higher intention to adopt those technologies.

Relationship between Facilitating Conditions and Adoption Intention

H8 proposed that apparel managers' perceived facilitating conditions positively affect their intention to adopt sustainable technology. The path between facilitating conditions and the adoption intention of sustainable technology was not found to be significant at $p < 0.05$ ($\gamma = 0.16$, $t = 1.44$). Therefore, H8 is not supported. The findings did not support the hypothesis that there is a positive relationship between managers' perceived facilitating conditions and adoption intention. As H8 is not supported, it can be interpreted as apparel firm managers' perceived facilitating conditions not significantly influencing their intention to adopt sustainable technology.

In the context of sustainability, Park (2020) found that facilitating conditions impacted managers' intention to use blockchain technology to meet sustainability-related goals. Some recent studies utilized UTAUT as their framework and found perceived facilitating conditions as significant determinants of the intention to adopt blockchain technology (Park, 2020; Queiroz & Wamba, 2019). In this study, facilitating condition was conceptualized as individuals' belief in the support and resources available to them for accomplishing a behavior (Dwivedi et al., 2007; Venkatesh et al., 2012). Facilitating conditions may include whether the managers have the resources to use sustainable technology and whether the existing operational infrastructure facilitates them to use sustainable technology, (Oliveira et al., 2016). It is the setting where the apparel managers find that there exist accessible infrastructures intended to support the use of the technology within the firm (Nazim et al., 2021). A possible reason for the nonsignificant relationship between facilitating conditions and adoption intention could be due to the insufficient facilitating conditions. Apparel managers in Bangladesh might feel that the resources are not available or still inadequate to support sustainable technology. The apparel industry of Bangladesh is still growing and has started focusing on sustainability issues since 2012 after receiving increased pressure from Western brands and their consumers. Though there is an increasing number of LEED-certified apparel firms in Bangladesh, when it is compared with the total number of apparel firms in Bangladesh, the ratio of these firms is very low. It might take time for the Bangladeshi apparel industry to ensure the required facilities and infrastructure to support the use of sustainable technology in most firms.

Relationship between Social Influences and Adoption Intention

H9 stated that apparel managers' perceived social influence positively affects their intention to adopt sustainable technology. The path in the model between the social influence and the adoption intention of sustainable technology was found to be positive and significant at $p < 0.001$ ($\gamma = 0.42$, $t = 4.12$). A statistically significant and positive relationship was found between social influence and adoption intention. Therefore, H9 is supported. In this dissertation, social influence was conceptualized as the extent to which an individual apparel manager perceives that other apparel professionals who are important to them think that they should adopt or use sustainable technology in apparel manufacturing. Apparel managers' perceived social influence significantly impacts their intention to adopt sustainable technology.

This result complies with several previous studies which were conducted based on the UTAUT framework (Ferri et al., 2020; Queiroz & Fosso Wamba, 2019). Prior research highlighted that adoption intention is impacted by the acts and opinions of friends, family members, and colleagues (Irani et al., 2009; Venkatesh & Brown, 2001). The social recognition offered by the close reference groups highly impacts the preference for technology acceptance (Venkatesh et al., 2003). Some recent research studies (Alazab et al., 2021; Nuryyev et al., 2020) have also shown how important social influence has become in technology adoption. Ferri et al. (2020) examined the factors that motivate auditors of large accountancy firms in Italy to use disruptive technology using the UTAUT framework. They found that social influence significantly affects the auditors' intention to use disruption technology. Using an integrated theoretical framework combining UTAUT and TOE, Nazim et al. (2021) showed that social influence was one of the significant factors in the adoption intention of blockchain technology. In addition, Queiroz and Fosso Wamba (2019), Park (2020), and Queiroz et al. (2021) found the significant role of social influence affecting the adoption intention of blockchain adoption. Especially the study of Park (2020), which is similar to the study of Nazim et al. (2021), investigated the usage intention of sustainable blockchain technology and found social influence as a significant determinant of the intention of managers' sustainable usage (using the technology in a way that addresses sustainability requirements) of blockchain technology.

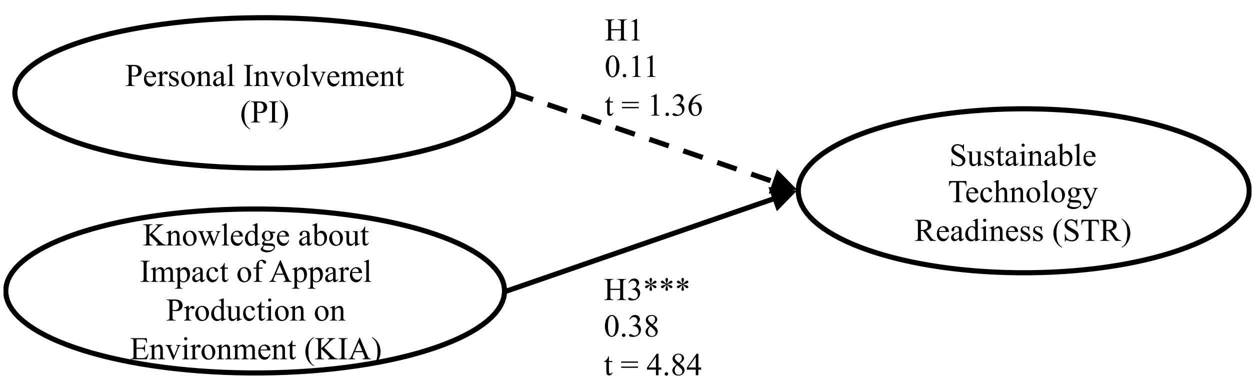
The findings of this study denote that influences from peers, close reference groups, and senior management play an important role in apparel manager's intention to adopt sustainable technology. It is evident from the overall findings of this study that the apparel managers in Bangladesh started understanding that sustainability is a matter of collaborative effort. Bangladeshi apparel managers perhaps started understanding that adopting sustainable technology requires collaboration among buyers, manufacturers, and raw material suppliers. At the same time, it also requires internal collaboration among different divisions within the apparel manufacturing firm. One manager from one department is connected, dependent, and influenced by other managers from other departments within the same firm to address sustainability initiatives as a whole. Here comes the mechanism of social influence. The social recognition offered by the other managers of other departments can highly impact the adoption of sustainable technology in Bangladesh.

Discussion of Alternative Model 2

Objective 1

As apparel technology knowledge (ATK) is dropped from the alternative model 2, H2 becomes invalid. To investigate the relationships of apparel managers' personal involvement in technology and their knowledge of the impact of apparel production on the environment with sustainable technology readiness, H1 and H3 were tested, and the results are shown in Figure 21.

Figure 21. Relationships of Knowledge and Involvement with Sustainable Technology Readiness (Alternative Model 2)



Note. The solid line represents a significant relationship, and the hypothesis is supported. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized path coefficients.

*** = $p < 0.001$

Relationship between Personal Involvement in Technology and Sustainable Technology Readiness

H1 stated that apparel firm managers' personal involvement in technology positively affects their sustainable technology readiness. As illustrated in Figure 21, the path in the model between personal involvement and sustainable technology readiness was not found significant at $p < 0.05$ ($\gamma = 0.11$, $t = 1.36$). Therefore, no evidence in the data supports the relationship proposed in the first hypothesis. This result did not meet the expectation that there is a positive and significant relationship between personal involvement in technology and sustainable technology readiness, as supported by previous studies (Celik & Kocaman, 2017; Turan et al., 2015).

Relationship between Knowledge about the Impact of Apparel Production on the Environment and Sustainable Technology Readiness

H3 proposed that apparel firm managers' knowledge about environmental impact of apparel production positively affects their sustainable technology readiness. This relationship was found to be positive and significant. The path in the model between knowledge of the impact of apparel production on the environment and sustainable technology adoption was positive and significant at $p < 0.001$ ($\gamma = 0.38$, $t = 4.84$). Therefore, data support the relationship proposed in the H3. Considering the results of the original model and Alternative Model 1, this result implies that knowledge of the impact of apparel production on the environment (KIA) and apparel technology knowledge (ATK) are both significant predictors of sustainable technology readiness (STR), but due to the strong correlation between KIA and ATK, they cannot be included in the same model.

Amel et al. (2009) found that individuals who are more knowledgeable about environmental issues tend to show more sustainable behavior. Consequently, knowledgeable apparel managers may be more likely to concentrate on their surroundings and more likely to be aware of minimizing and controlling the environmental impacts of apparel manufacturing (Jenkin et al., 2011). Some prior studies suggested that knowledge about unfavorable environmental consequences has a significant impact on environmentally friendly measures (Dalvi-Esfahani et al., 2017; Mayer et al., 2015). Individuals' environmental knowledge is associated with their understanding of the outcomes of their behaviors on the environment or on other individuals (De Groot & Steg, 2009). The knowledge of the environmental impacts of manufacturing can establish the belief that the existing conditions of the environment may be threatening individuals' valuable things, which can enhance the level of their optimism toward environmentally friendly tools and technologies (Asadi et al., 2021; Mishra et al., 2014). Thus, individuals who have more knowledge of undesirable outcomes of a manufacturing operation will be more likely to have a positive view toward sustainable technology. This finding also indicates that apparel managers in Bangladesh tend to maintain a strong belief that technology provides them with increased flexibility, control, and efficiency (Parasuraman, 2000), enabling them to reduce undesirable environmental outcomes and gain better control over environmental impacts (Eriksson et al., 2006; Kang et al., 2013).

Objective 2

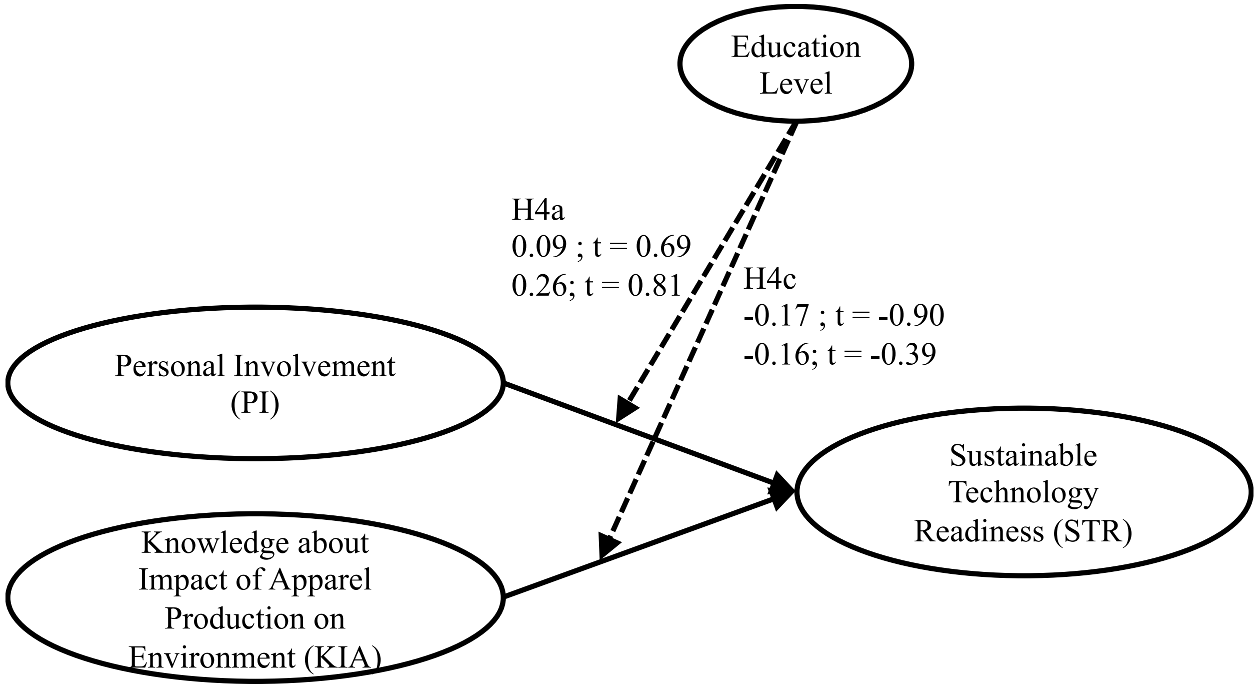
For investigating the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness, H4a, H4c, H5a, and H5c were tested using PROCESS v4 by Andrew F. Hayes (Hayes, 2012). For the variable education, there were three levels: (1) Having a master's degree or above;

(2) Having a bachelor's degree; and (3) Not having a bachelor's degree. For the variable experience, there were also three levels: (1) 2-5 years; (2) 6-9 years; (3) 10 or more years. Findings are interpreted and discussed in the following paragraphs.

Moderating Role of Education in the Relationships between Managers' Knowledge and Involvement and their Sustainable Technology Readiness

H4a proposed that apparel managers' education level moderates the relationship between their personal involvement and sustainable technology readiness. The analysis results show that no moderating effect was found. H4c stated that apparel managers' education level moderates the relationship between their knowledge about the impact of apparel production on the environment and sustainable technology readiness. The results indicate no moderating effect of education level. Figure 22 presents the results of testing the moderating effect of education level on the relationships of personal involvement and knowledge about the environmental impact of apparel production with sustainable technology readiness.

Figure 22. Results of the Moderating Role of Education Level (Alternative Model 2)



Note. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized beta coefficients (p < 0.05) as moderator variables received from PROCESS v4 output.

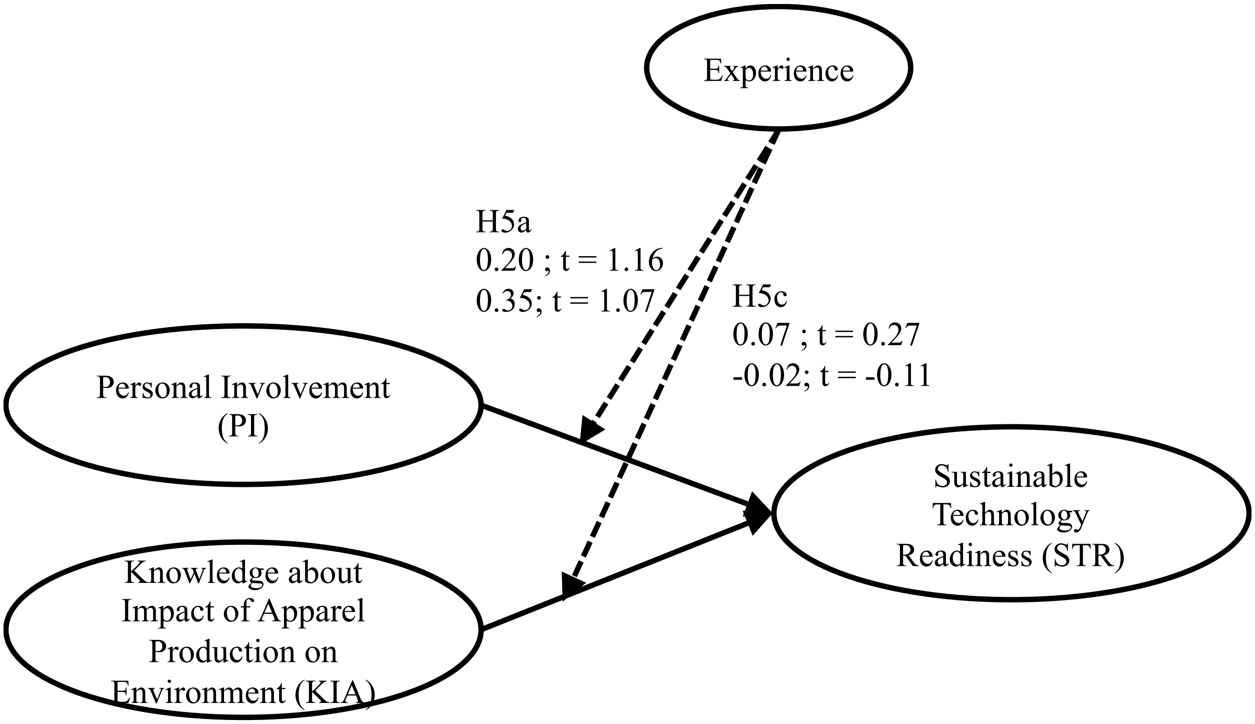
As Education had three levels, for H4a, there were two standardized beta coefficients of the moderator variable in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = 0.09$, $t = 0.69$; $Beta_2 = 0.26$, $t = 0.81$). Therefore, there is not enough statistically significant evidence to support H4a. The findings did not support the hypothesis that education level moderates the relationship between managers' personal involvement and their sustainable technology readiness.

For H4c, based on the two standardized beta coefficients of the moderator variable shown in PROCESS v4 output, neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = -0.17$, $t = -0.90$; $Beta_2 = -0.16$, $t = -0.39$). Therefore, there is not enough statistically significant evidence to support H4c. The findings did not support the hypothesis that education level moderates the relationship between managers' knowledge about the impact of apparel production on the environment and their sustainable technology readiness.

Moderating Role of Experience in the Relationships between Managers' Knowledge and Involvement and Their Sustainable Technology Readiness

H5a stated that apparel managers' working experience moderates the relationship between their personal involvement in technology and sustainable technology readiness. The analysis results show that no moderating effect was found. H5c proposed that apparel managers' working experience moderates the relationship between their knowledge about the impact of apparel production on the environment and sustainable technology readiness. The results indicate no moderating effect of working experience. Figure 23 presents the results of testing the moderating effect of working experience on the relationships of personal involvement and knowledge about the impact of apparel production on the environment with sustainable technology readiness.

Figure 23. Results of the Moderating Role of Working Experience (Alternative Model 2)



Note. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized beta coefficients ($p < 0.05$) as moderator variables received from PROCESS v4 output.

As Experience had three levels, for H5a, there were two standardized beta coefficients of the moderator variable found in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$ ($Beta_1 = 0.20$, $t = 1.16$; $Beta_2 = 0.35$, $t = 1.07$). Therefore, there is not enough statistically significant evidence to support H5a. The findings did not support the hypothesis that working experience moderates the relationship between managers' personal involvement and their sustainable technology readiness.

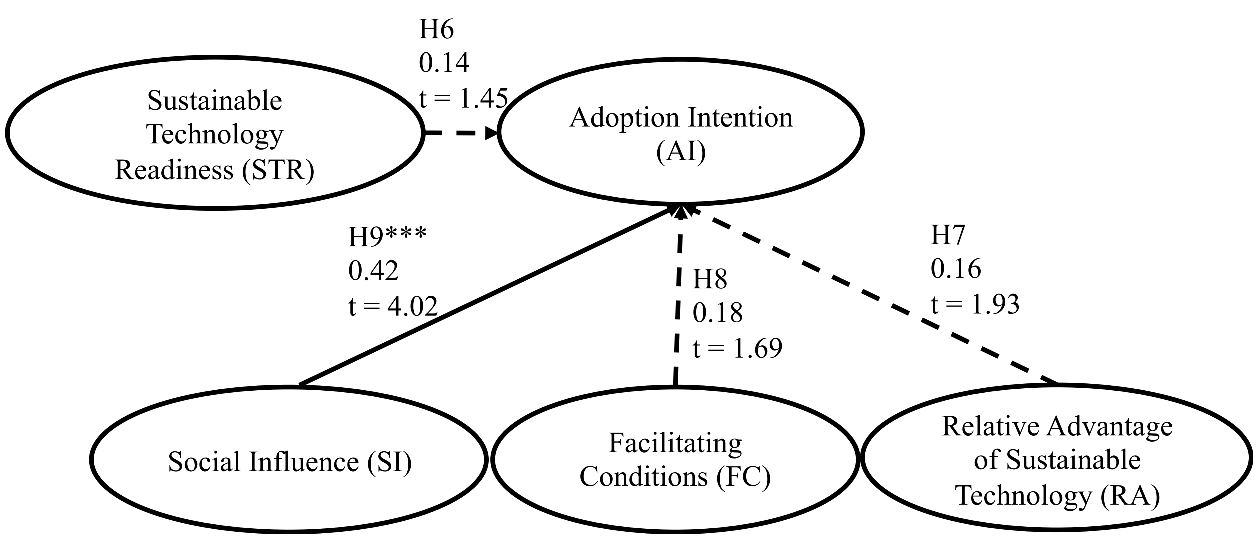
For H5c, two standardized beta coefficients of the moderator variable were found in PROCESS v4 output. Neither of the standardized beta coefficients was significant at $p < 0.05$

($Beta_1 = 0.07$, $t = 0.27$; $Beta_2 = -0.02$, $t = -0.11$). Therefore, there is not enough statistically significant evidence to support H5c. The findings did not support the hypothesis that working experience moderates the relationship between managers' knowledge about the impact of apparel production on the environment and their sustainable technology readiness.

Objective 3

To investigate the relationships of apparel managers' sustainable technology readiness and their perceptions of social influences, facilitating conditions, and relative advantage of sustainable technology with their intention to adopt sustainable technology, H6, H7, H8, and H9 were tested. Figure 24 presents the results of hypothesis testing of H6, H7, H8, and H9.

Figure 24. Relationships of Sustainable Technology Readiness, Social Influences, Facilitating Conditions, and Relative Advantage with Adoption Intention (Alternative Model 2)



Note. The solid line represents a significant relationship, and the hypothesis is supported. Dashed lines represent non-significant relationships, and the hypotheses are not supported. The coefficients presented are standardized path coefficients.

*** = $p < 0.001$

Relationship between Sustainable Technology Readiness and Adoption Intention

The path between sustainable technology readiness and adoption intention of sustainable technology was found to be nonsignificant at $p < 0.05$ ($\beta = 0.14$, $t = 1.45$). Therefore, there is not enough statistically significant evidence to support the relationship proposed in H6 (the relationship between sustainable technology readiness and adoption intention). That means apparel managers with a high level of sustainable technology readiness may not possess a high level of intention to adopt sustainable technology. This result is similar to the result of alternative model 1.

Relationship between Relative Advantage and Adoption Intention

The path in the model between relative advantage and adoption intention of sustainable technology was not found to be positive and significant at $p < 0.05$ ($\gamma = 0.16$, $t = 1.93$). Therefore, there exists no evidence in the data to support the relationship proposed in H7 (the relationship between the relative advantage of sustainable technology and adoption intention).

Previous studies consistently supported a positive relationship between technology adoption and relative advantage (Agarwal & Prasad., 1997; Chong et al., 2009; Ramayah et al., 2013; Tornatzky & Klein, 1982). Some recent studies also found relative advantage as a significant factor in the intention to use a particular technology in various contexts. The result of this alternative model 2 does not comply with the findings of previous studies.

Relationship between Facilitating Conditions and Adoption Intention

The path between facilitating conditions and adoption intention of sustainable technology was not found to be significant at $p < 0.05$ ($\gamma = 0.18$, $t = 1.69$). Therefore, H8 is not supported. The findings did not support the hypothesis that there is a positive relationship between managers' perceived facilitating conditions and adoption intention. As H8 is not supported, it can be interpreted as apparel firm managers' perceived facilitating conditions not significantly influencing their intention to adopt sustainable technology. This result is similar to the result of alternative model 1.

Relationship between Social Influences and Adoption Intention

The path in the model between the social influence and the adoption intention of sustainable technology was found to be positive and significant at $p < 0.001$ ($\gamma = 0.42$, $t = 4.02$). A statistically significant and positive relationship was found between social influence and adoption intention. Therefore, H9 is supported. This implies that apparel managers' perceived social influence significantly impacts their intention to adopt sustainable technology. This result is similar to the result of alternative model 1.

Conclusions

This empirical study examined the antecedents influencing apparel managers' readiness toward sustainable technology and the adoption intention of sustainable technology by apparel managers in the context of the Bangladesh apparel industry. The three main research objectives of this dissertation are:

1. To investigate the relationships between the knowledge and involvement of the managers and their readiness toward sustainable technology.

2. To examine the moderating role of education and experience of the managers in the relationships between managers' knowledge and involvement and their sustainable technology readiness.

3. To investigate how apparel managers' sustainable technology readiness, their perceptions of social influence, facilitating conditions, and relative advantage of sustainable technology impact their intention to adopt sustainable technology.

Based on a thorough literature review, a conceptual model was developed (Figure 7, see page 59). Managers' personal involvement, apparel technology knowledge, sustainable technology readiness, relative advantage, facilitating conditions, social influence and adoption intention were the latent constructs and they were measured by their respective manifest variables (Table 8, see pages 79-83). Personal involvement, apparel technology knowledge, relative advantage, facilitating conditions, and social influence were exogenous latent variables. Sustainable technology readiness and adoption intention were endogenous latent variables. The manager's education level and working experience were two moderating variables. The conceptual model includes nine hypotheses. It was hypothesized that personal involvement and apparel technology knowledge impacts sustainable technology readiness. The education level and experience of the managers were hypothesized as moderating variables on the relationship between personal involvement, apparel technology knowledge, and sustainable technology readiness. Additionally, the conceptual model also hypothesized that sustainable technology readiness, relative advantage, facilitating conditions, and social influence have an impact on the adoption intention of the managers toward sustainable technology.

Empirical data were gathered using a survey method from the apparel firm managers of Bangladesh. A total of 4315 surveys were distributed, 376 responses were received (a response rate of 8.71%), and 221 valid responses were finally used for further statistical analysis. Structural equation modeling was used to analyze the conceptual model. The measurement model was first evaluated using confirmatory factor analysis, and then the structural model was tested to assess the hypothesized relationships.

The nine hypotheses in the original model were tested and the results were examined carefully. Some of the standardized path coefficients of SEM output showed unusual results. After a thorough investigation of the data and model, two alternative models were examined by removing either knowledge of the impact of apparel production on the environment (KIA) or apparel technology knowledge (ATK) from the original model.

Alternative Model 1

The findings of Alternative Model 1 indicated significant relationships between apparel technology knowledge and sustainable technology readiness, between relative advantage and adoption intention, and between social influence and adoption intention as hypothesized in the model except for the moderating effects of education and experience. Three relationships (Personal Involvement – Sustainable Technology Readiness; Sustainable Technology Readiness – Adoption Intention; and Facilitating Condition – Adoption Intention) were not found significant. Specifically, several conclusions can be drawn from the study results.

First, the result of this study demonstrated a relationship between apparel technology knowledge and sustainable technology readiness. Knowledge about technology and sustainability has become very important in the apparel industry. It is evident from the result that apparel managers in Bangladesh are now knowledgeable about technology and sustainability. Most importantly, apparel managers in Bangladesh can make effective connections between technology and sustainability. They started perceiving that technology could be an effective solution to addressing sustainability-related issues in apparel manufacturing. This improvement is beneficial for the global apparel supply chain because Bangladesh is one of the world's largest providers of apparel products.

Second, it is also evident from the findings that the apparel managers' perception of the relative advantage of sustainable technology plays an important role in their adoption of sustainable technology. This proves that the apparel firms in Bangladesh started captivating sustainability into thoughtful consideration for improving their business performance, and thus the managers recognized the advantages of sustainability-related technology, which in turn impacts their intention to adopt those technologies at their firm. This exploration of the advantages of sustainability-related technology enhances their knowledge, optimism, and innovativeness toward technological solutions for sustainability.

Third, the findings demonstrated the positive relationship between managers' perceived social influence and their intention to adopt sustainable technologies in apparel firms. This proves that influences from peers, close reference groups, and senior management play a critical role in apparel managers' intention to adopt sustainable technology. The managers of Bangladeshi apparel firms believe that people who influence their behavior think they should use sustainable technology in their daily operations of the apparel business.

Fourth, the findings demonstrated that education and experiences do not impact the relationship between the antecedents of sustainable technology readiness (personal involvement and apparel technology knowledge) and sustainable technology readiness.

Alternative Model 2

The findings of Alternative Model 2 indicated significant relationships between managers' knowledge of the impact of apparel production on the environment and sustainable technology readiness and between social influence and adoption intention, as hypothesized in the model. Four relationships (Personal Involvement – Sustainable Technology Readiness; Sustainable Technology Readiness – Adoption Intention; Relative Advantage – Adoption Intention; and Facilitating Condition – Adoption Intention) were not found significant.

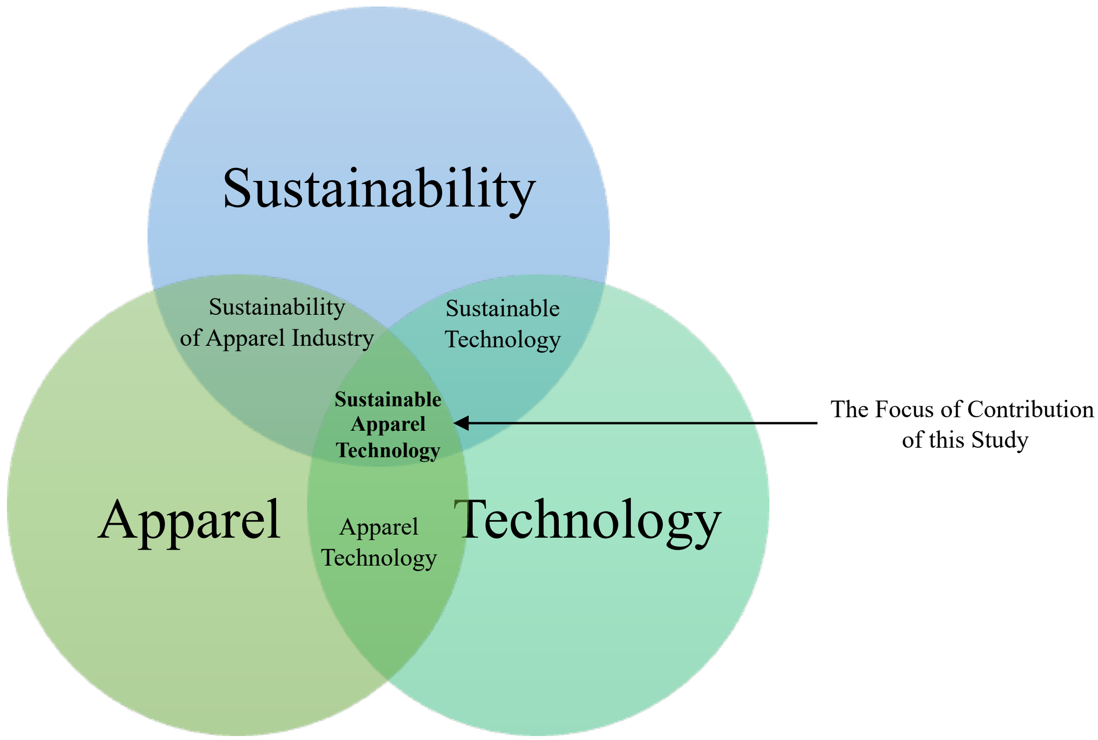
Alternative Model 2 depicts that there is a positive and significant relationship between managers' knowledge of the impact of apparel production on the environment and their sustainable technology readiness. Apparel managers in Bangladesh may have knowledge about the environmental impact of apparel production and may be optimistic about sustainability, which can make them optimistic about the ability of technology to address sustainability. Managers who have more knowledge of undesirable outcomes of a manufacturing operation will be more likely to have a positive view toward sustainable technology. They tend to maintain a strong belief that technology provides them with increased flexibility, control, and efficiency (Parasuraman, 2000), enabling them to reduce undesirable environmental outcomes and gain better control over environmental impacts (Eriksson et al., 2006; Kang et al., 2013). It is possible that this strong belief started growing in the mind of Bangladeshi apparel managers. It is understandable that the regular practice of sustainability-related technologies might improve the belief about the ability of technology to improve environmental sustainability issues. It is also important to note from the findings that, in the apparel industry of Bangladesh, it is not yet a daily life practice of conceptualizing technology as one of the finest solutions to address sustainability.

The findings of Alternative Model 2 showed that education and experiences do not impact the relationship between the antecedents of sustainable technology readiness (personal involvement and knowledge about the environmental impact of apparel production) and sustainable technology readiness. In addition, the results of Alternative Model 2 demonstrate the significant impact of social influence on apparel managers' adoption intention toward sustainable technology, which is consistent with the finding of Alternative Model 1.

Implications

This dissertation made various significant contributions to studying technology readiness and sustainability within the apparel industry context. The dissertation is among the first study that investigates both the antecedents of sustainable technology readiness and the impact of sustainable technology readiness on the intention to adopt sustainable technology in the apparel industry. To date, few studies have collected empirical survey data from individual apparel professionals in the Bangladeshi apparel industry to investigate their technology adoption behavior in the context of sustainability. The findings of the study revealed that improved knowledge about technology could increase the readiness level of apparel managers toward energy and resource-saving technologies. The relative advantage of sustainable technology and social influences impact apparel managers' adoption intention toward sustainable technology. Theoretically and practically, the findings of this study will help extend the effort toward sustainable development in the apparel industry context and enhance our understanding of the triple bottom line of the sustainability concept – people, profit, and plane. By bridging theory and practice, this dissertation highlighted the strong connection between technology and sustainability in the apparel manufacturing supply chain, which is the primary focus of this dissertation. Figure 25 illustrates the focus of the contribution of this dissertation. During the data collection process, survey respondents expressed their strong interest in learning the study results and indicated the significance of this study to Bangladesh's apparel industry. Therefore, the findings of this dissertation have both academic and industry implications.

Figure 25. The Focus of Contribution of this Study



Implications for Academic Research

The dissertation offers several theoretical implications. First, this dissertation contributes to the existing literature on apparel sustainability by conducting technology-based empirical research in the apparel manufacturing industry. In recent years, empirical research on technology issues in the apparel supply chain has been rapidly increasing. However, the uniqueness of this study is that the study examined technology readiness in the context of sustainability. This study is among the few extant studies that examined the technology readiness of apparel firm managers. Previous literature lacks a focus on measuring the technology readiness of apparel manufacturing professionals. This study not only focused on technology readiness but also incorporated sustainability into the concept of technology readiness. This unique theoretical standpoint of the study contributes to the technology adoption literature. It also contributes to the sustainability literature by explaining the interaction of sustainability and technology.

Second, this study used managers' personal characteristics (involvement in technology and apparel technology knowledge) as antecedents of sustainable technology readiness. This finding signifies and reconfirms the relationship between individuals' characteristics and their overall attitude toward adopting a particular technology. This contribution is very important for apparel sustainability literature because previous studies did not focus on these relationships in the apparel industry context.

Third, this study adopted the scale of measuring general technology readiness and applied it to measure the readiness of the apparel firm managers toward sustainability-related technology. The findings suggest that among the four dimensions of technology readiness (optimism, innovativeness, discomfort, and insecurity), the scales of the two dimensions (optimism, innovativeness) effectively measured the technology readiness of apparel managers in Bangladesh.

Fourth, this study expands our understanding of the causal flow among cognitive variables of the apparel firm managers, including their knowledge, personal involvement, technology readiness, and adoption intention toward sustainable technology in a developing country Bangladesh. Though the apparel industry of Bangladesh is one of the largest in the world, researchers kept little focus on the Bangladeshi apparel industry. As a major contributor to the global apparel supply chain, Bangladesh's apparel industry deserves more attention from academic researchers worldwide. This study was dedicated to analyzing the technology adoption behavior of apparel firm managers in Bangladesh in a sustainability context.

Implications for Practice and Industry

There are several practical implications of this dissertation. First, as sustainable technology-related empirical research is scarce in the context of the apparel industry, this study will serve as empirical evidence about the importance of sustainable technology adoption in the apparel industry. By analyzing the empirical data collected from Bangladesh's apparel professionals, the study provides a deep understanding of sustainable technology readiness and adoption intention of Bangladeshi apparel managers. The global apparel industry has been facing increased pressure to meet sustainability requirements. Though the primary source of this pressure is the end consumers, this pressure is converted into different environmental regulations imposed by fashion brands and retailers on apparel manufacturers (Islam et al., 2021). Technology adoption by manufacturers is considered one of the essential steps to address these sustainability regulations (Bag et al., 2021; Islam et al., 2021). In this context, understanding the technology readiness of the managers working in the industry helps initiate technological transformation.

Second, this dissertation provides evidence on the role of apparel professionals' characteristics (e.g., knowledge and involvement) in their sustainable technology readiness. Being enlightened by this study, top management of apparel firms can focus on improving the managers' knowledge in terms of sustainable technology, which will benefit the firms in their early adoption of technologies to address sustainability issues. Sustainable technology-triggered transformation (Parasuraman & Colby, 2015) is likely to accelerate in the apparel industry in the future because more and more technologies will be applied in the apparel industry to contribute to improving efficiency and productivity, increasing energy saving and water saving, and reducing waste. This sustainable technology transformation will ultimately help the apparel industry address sustainability-related issues (Al-Ashmori et al., 2022; Caldarelli et al., 2021; Enyoghasi & Badurdeen, 2021; Park, 2020). Therefore, it was crucial to understand the antecedents of apparel managers' sustainable technology readiness and the factors impacting their adoption intention toward sustainable technology.

Third, the findings of this study provide valuable guidance for the government and other policymakers in increasing the use of sustainable technologies in the apparel industry. The findings can help the government initiate and regulate environmental policies related to the apparel industry. When the government and other policymakers understand how perceived relative advantage, facilitating conditions, and social influence impact apparel managers' adoption intention toward sustainable technology, they will be able to formulate favorable technology policies, including developing import tax policies for sustainable technologies and providing training and resources for managers to use sustainable technology. These efforts can ultimately improve the perceived facilitating conditions in adopting sustainable technologies in apparel firms. When managers have a favorable perception of facilitating conditions, their willingness to adopt sustainable technology will be stronger.

Fourth, this study's results suggest that Bangladesh's apparel professionals collectively impact technological advancement and the apparel industry's upgrade. The apparel industry is the primary industry in Bangladesh. When the majority of apparel firms in Bangladesh start adopting sustainable technologies, it will be easier for Bangladesh to meet the Sustainable Development Goals (SDG), especially goal number 12 (Responsible Consumption and Production) and 13 (Climate Action) (SDGS, 2022). Furthermore, the Bangladeshi government can develop strategies to support and train apparel managers to adopt sustainability-related technologies within an established sustainable investment. Moreover, the findings of this study will help the apparel industry in other countries assess the readiness and intention of their managers to adopt new and sustainable technology in the future.

Limitations

As every study has limitations, this study also has some. First, this study was only focused on the apparel industry. The hypothesized relationships were tested using the data collected from managers of 100% export-oriented apparel firms in Bangladesh. The findings might include some influence from cultural variables. Therefore, the application of the findings of this study in other industries should be made with caution.

Second, including all relevant constructs in a model is not always possible, even with literature support. Some factors might contribute to explaining managers' technology readiness and adoption intention but were not included in the present study. Therefore, the existence of confounding variables must be recognized. For example, this study did not include variables like buyer's influence, top management's perspective, and investment policy of the firm. It is possible that some of these factors may contribute to the explanation of the relationships in the model.

Third, the measurement scales that were adapted from the previous literature were not tested and established in the apparel industry context. It is possible that a few respondents might have difficulty understanding the items because of cultural and language differences.

Fourth, in the existing literature, the definition of sustainable technology in the context of the apparel industry is limited. It is possible that the prompt used in the survey regarding the definition and examples of sustainable technology in the apparel industry might not have been appropriately communicated with the managers who responded to the survey.

Finally, another limitation is that this dissertation survey can only give a "snapshot" picture of Bangladeshi apparel managers' sustainable technology readiness and adoption intention. As technology is moving faster than ever before and more and more apparel professionals are utilizing sustainable technology, the results of the present study may need future research to confirm.

Recommendations for Future Research

Technology and sustainability are becoming the two key determinants of achieving supply chain excellence in the global textile and apparel industry. Based on the findings of this study, several future research agendas can be recommended.

First, this study was an individual-level study. The study provides a baseline for longitudinal studies of sustainable technology adoption. Longitudinal follow-up studies should be designed to examine changing strategies and practices. Therefore, future research could collect data on the factors in the model through a longitudinal study and reexamine the relationships between the factors in the model. In addition, future studies can investigate the long-term impact of adopting sustainable technology on apparel firms' competitiveness and financial performance. These future studies can answer how dynamic environments impact the relationships between the variables and how the adoption of sustainable technology can assist firms in achieving global competitiveness in the long run.

Second, this current study did not consider the interaction between sustainable technology adoption and textile and apparel supply chain management. Future studies can explore the role of sustainable technology adoption in enhancing supply chain performance. Also, future research could examine how supply chain relationships impact sustainable technology adoption. Specifically, future research can address how different supply chain stakeholders may collaborate to promote the adoption of sustainable technology in the apparel industry.

Third, it is important to conduct policy-related research in the apparel industry. Future studies can explore and examine the impact of incentives, regulations, and policies of the government on the adoption behavior toward sustainable technology in apparel firms. For example, future research could investigate how international trade regulations and agreements and sustainability-related regulations impact apparel manufacturing firms' adoption of sustainable technologies.

Fourth, future research can examine the role of other factors that were not included in the model but may contribute to the explanation of sustainable technology adoption. For example, future research can investigate the role of organizational culture in adopting sustainable technology in apparel manufacturing firms.

Fifth, future studies can investigate the potential impact of emerging technologies in addressing sustainability issues in the apparel supply chain. Industry 4.0 technologies like blockchain, artificial intelligence, big data, internet of things (IOT), and 3D printing can be helpful in sustainable manufacturing. Specifically, future studies can explore the potential ways where these technologies can be used to promote sustainability practices.

Six, another interesting direction for future research is to include apparel manufacturing professionals in other countries. Testing the relationships based on the data collected from apparel managers in other countries would increase the generalizability of the results on an international basis.

Last, existing literature has very few examples of qualitative case studies on technology and sustainability in the apparel industry context. Future research can focus on conducting more qualitative case studies to better understand the actual readiness of apparel firms and their workforce toward sustainable technologies.

In sum, the purpose of this dissertation was to investigate the issues related to technology readiness toward and adoption intention of sustainable technology by apparel managers in the context of the Bangladesh apparel industry. Findings demonstrate that apparel managers' apparel technology knowledge and knowledge of the impact of apparel production on the environment affect their sustainable technology readiness, and their perception of social influence impacts their adoption intention of sustainable technology. Improving apparel managers' technology knowledge and their sustainability knowledge may enhance their readiness to use sustainable technology. The findings also denote that influences from peers, close reference groups, and senior management play an important role in apparel managers' intention to adopt sustainable technology. This dissertation specifies evidence on the role of apparel professionals' characteristics in their sustainable technology readiness. The findings will provide valuable guidance for policymakers in increasing the use of sustainable technologies in the apparel industry. In conclusion, this dissertation provides empirical substantiation on the interaction between technology and sustainability and it is expected that future research can examine "Sustainable Technology Readiness" in other industries where the theoretical background demands an interaction between technology and sustainability.

REFERENCES

Aaker, D. A., Kumar, V., & Day, G. S. (2008). *Marketing Research*. John Wiley & Sons.

Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented innovation: A systematic review. *International Journal of Management Reviews*, *18*(2), 180–205.

Agarwal, R., & Prasad., J. (1997). Role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision Sciences*, *28*(3), 557–582.

Agarwal, Ritu, & Prasad, J. (1998a). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*(2), 204–215. https://doi.org/10.1287/isre.9.2.204

Agarwal, Ritu, & Prasad, J. (1998b). The antecedents and consequents of user perceptions in information technology adoption. *Decision Support Systems*, *22*(1), 15–29. https://doi.org/10.1016/S0167-9236(97)00006-7

Ahlquist, J. S., & Mosley, L. (2021). Firm participation in voluntary regulatory initiatives: The Accord, Alliance, and US garment importers from Bangladesh. *The Review of International Organizations*, *16*(2), 317–343.

Ahmad, A., Madi, Y., Abuhashesh, M., Nusairat, N. M., & Masa'deh, R. (2020). The knowledge, attitude, and practice of the adoption of green fashion innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(4), 1–20. https://doi.org/10.3390/joitmc6040107

Ahmad, N., Amer, N. T., Qutaifan, F., & Alhilali, A. (2013). Technology adoption model and a road map to successful implementation of ITIL. *Journal of Enterprise Information Management*, *26*(5), 553–576. https://doi.org/10.1108/JEIM-07-2013-0041

Ahmad, S. Z., & Khalid, K. (2017). The adoption of M-government services from the user's perspectives: Empirical evidence from the United Arab Emirates. *International Journal of Information Management*, *37*(5), 367–379. https://doi.org/10.1016/j.ijinfomgt. 2017.03.008.

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*. Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.

Ajzen, Icek. (1985). *From intentions to actions : A theory of planned behavior*.

Al-Ashmori, A., Basri, S. Bin, Dominic, P. D. D., Capretz, L. F., Muneer, A., Balogun, A. O., Gilal, A. R., & Ali, R. F. (2022). Classifications of sustainable factors in blockchain adoption: A literature review and bibliometric analysis. *Sustainability (Switzerland)*, *14*(9). https://doi.org/10.3390/su14095176

Alazab, M., Alhyari, S., Awajan, A., & Abdallah, A. B. (2021). Blockchain technology in supply chain management: an empirical study of the factors affecting user adoption/acceptance. *Cluster Computing*, *24*(1), 83–101. https://doi.org/10.1007/s10586-020-03200-4

Alsultanny, Y., & AlZuhair, S. (2019). Evaluating influence of technology readiness factors on the Saudi cement companies market and financial based performance. *Journal of Science and Technology Policy Management*, *10*(2), 360–370. https://doi.org/10.1108/JSTPM-09-2017-0047

Amel, E. L., Manning, C. M., & Scott, B. A. (2009). Mindfulness and sustainable behavior: Pondering attention and awareness as means for increasing green behavior. *Ecopsychology*, *1*(1), 14–25.

Aminpour, P., Gray, S., Richardson, R., Singer, A., Castro-Diaz, L., Schaefer, M., Ramlan, M. A., & Chikowore, N. R. (2020). Perspectives of scholars on the nature of sustainability: A survey study. *International Journal of Sustainability in Higher Education*, *21*(1), 34–53. https://doi.org/10.1108/IJSHE-05-2019-0161

Andersen, T. J., & Segars, A. H. (2001). The impact of IT on decision structure and firm performance: Evidence from the textile and apparel industry. *Information and Management*, *39*(2), 85–100. https://doi.org/10.1016/S0378-7206(01)00081-7

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*(3), 396–402.

Arribas, V., & Alfaro, J. A. (2018). 3D technology in fashion: From concept to consumer. *Journal of Fashion Marketing and Management: An International Journal*, *22*(2), 240–251.

Arts, J. W. C., Frambach, R. T., & Bijmolt, T. H. A. (2011). Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behavior. *International Journal of Research in Marketing*, *28*(2), 134–144.

Asadi, S., Nilashi, M., Samad, S., Rupani, P. F., Kamyab, H., & Abdullah, R. (2021). A proposed adoption model for green IT in manufacturing industries. *Journal of Cleaner Production*, *297*, 126629. https://doi.org/10.1016/j.jclepro.2021.126629

Azevedo, S. G., & Carvalho, H. (2012). RFID technology in the fashion supply chain: An exploratory analysis. In T. M. Choi (Ed.), *Fashion Supply Chain Management: Industry and Business Analysis* (pp. 303–326). IGI Global, USA.

Babl, C., Schiereck, D., & von Flotow, P. (2014). Clean technologies in German economic literature: A bibliometric analysis. *Review of Managerial Science*, *8*(1), 63–88. https://doi.org/10.1007/s11846-012-0095-8

Bag, S., Yadav, G., Dhamija, P., & Kataria, K. K. (2021). Key resources for industry 4.0 adoption and its effect on sustainable production and circular economy: An empirical study. *Journal of Cleaner Production*, *281*, 125233. https://doi.org/10.1016/j.jclepro.2020.125233

Baishya, K., & Samalia, H. V. (2020). Extending unified theory of acceptance and use of technology with perceived monetary value for smartphone adoption at the bottom of the pyramid. *International Journal of Information Management*, *51*, 102036.

Bangladesh Bank. (2022). *Bangladesh Bank Home*. https://www.bb.org.bd/index.php

Bangladesh Bureau of Statistics. (2022). *Bangladesh Bureau of Statistics-Government of the People's Republic of Bangladesh*. http://bbs.gov.bd/

Bansal, P., & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, *43*(4), 717–736.

Bartlett, M. S. (1950). Tests of significance in factor analysis. *British Journal of Statistical Psychology*, *3*(2), 77–85.

Beck, D., & Storopoli, J. (2021). Cities through the lens of Stakeholder Theory: A literature review. *Cities*, *118*(11), 103377.

Belis-Bergouignan, M.-C., Oltra, V., & Saint Jean, M. (2004). Trajectories towards clean technology: example of volatile organic compound emission reductions. *Ecological Economics*, *48*(2), 201–220. https://doi.org/https://doi.org/10.1016/j.ecolecon.2003.09.010

Berlilana, Noparumpa, T., Ruangkanjanases, A., Hariguna, T., & Sarmini. (2021). Organization benefit as an outcome of organizational security adoption: The role of cyber security readiness and technology readiness. *Sustainability (Switzerland)*, *13*(24). https://doi.org/10.3390/su132413761

Berthon, M. A. (2016). *Textile Waste Comes in Many Forms: Cooper Hewitt, Smithsonian Design Museum*. https://www.cooperhewitt.org/2016/11/15/textile-waste/

Bertola, P., & Teunissen, J. (2018). Fashion 4.0. Innovating fashion industry through digital transformation. *Research Journal of Textile and Apparel*, *22*(4), 352–369.

BGMEA. (2022). *Bangladesh Garments Manufacturers and Exporters Association(BGMEA)*. http://www.bgmea.com.bd/home/pages/TradeInformation

Bhogal, B., & Govind, D. (2021). An overview of textile and clothing industry in economic growth of India and Bangladesh. *International Journal of Management (IJM)*, *12*(2), 875–882. https://doi.org/10.34218/IJM.12.2.2021.085

Blackman, A., & Bannister, G. J. (1998). Community pressure and clean technology in the informal sector: An econometric analysis of the adoption of propane by traditional Mexican brickmakers. *Journal of Environmental Economics and Management*, *35*(1), 1–21.

Blair, J. J., Czaja, R. F., & Blair, E. (2013). *Designing Surveys: A Guide to Decisions and Procedures* (3rd ed.). Sage Publications. https://doi.org/10.1177/0092055x0603400110

Blut, M., & Wang, C. (2020). Technology readiness: a meta-analysis of conceptualizations of the construct and its impact on technology usage. *Journal of the Academy of Marketing Science*, *48*(4), 649–669. https://doi.org/10.1007/s11747-019-00680-8

Bradford, M., & Florin, J. (2003). Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems. *International Journal of Accounting Information Systems*, *4*(3), 205–225.

Brockman, B. K., & Morgan, R. M. (2003). The role of existing knowledge in new product innovativeness and performance. *Decision Sciences*, *34*(2), 385–419.

Brundtland, G. H. (1987). *Report of the World Commission on environment and development: 'Our common future.'*

Burke, S., & Sinclair, R. (2015). Computer-aided design (CAD) and computer-aided manufacturing (CAM) of apparel and other textile products. In R. Sinclair (Ed.), *Textiles and Fashion* (pp. 671–703). Elsevier.

Cainelli, G., D'Amato, A., & Mazzanti, M. (2015). Adoption of waste-reducing technology in manufacturing: Regional factors and policy issues. *Resource and Energy Economics*, *39*, 53–67.

Caldarelli, G., Zardini, A., & Rossignoli, C. (2021). Blockchain adoption in the fashion sustainable supply chain: Pragmatically addressing barriers. *Journal of Organizational Change Management*. https://doi.org/10.1108/JOCM-09-2020-0299

Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: Moving toward new theory. *International Journal of Physical Distribution and Logistics Management*, *38*(5), 360–387. https://doi.org/10.1108/09600030810882816

Celik, H., & Kocaman, R. (2017). Roles of self-monitoring, fashion involvement and technology readiness in an individual's propensity to use mobile shopping. *Journal of Systems and Information Technology*, *19*(3–4), 166–182. https://doi.org/10.1108/JSIT-01-2017-0008

Chan, H. L. (2016). Using radiofrequency identification (RFID) technologies to improve decision-making in apparel supply chains. In T. M. Choi (Ed.), *Information Systems for the Fashion and Apparel Industry* (pp. 41–62). Woodhead Publishing, Elsevier.

Chaw Hlaing, E., Krzywinski, S., & Roedel, H. (2013). Garment prototyping based on scalable virtual female bodies. *International Journal of Clothing Science and Technology*, *25*(3), 184–197.

Chawla, D., & Joshi, H. (2018). The moderating effect of demographic variables on mobile banking adoption: An empirical investigation. *Global Business Review*, *19*(3_suppl), S90–S113. https://doi.org/10.1177/0972150918757883

Cheng, C., Yang, C., & Sheu, C. (2014). The link between eco-innovation, business performance: A Taiwanese industry context. *Journal of Cleaner Production*, *64*, 81–90.

Chi, T. (2018). Understanding Chinese consumer adoption of apparel mobile commerce: An extended TAM approach. *Journal of Retailing and Consumer Services*, *44*(5), 274–284.

Chong, A. Y. L., Lin, B., Ooi, K. B., & Raman, M. (2009). Factors affecting the adoption level of c-commerce: An empirical study. *Journal of Computer Information Systems*, *50*(2), 13–22.

Chung, S. W. (2019). *Fast Fashion Is 'Drowning' the World. We Need a Fashion Revolution!* www.greenpeace.org/international/story/7539/fast-fashion-is-drowning-the-world-we-need-a- fashion-revolution/

Clottey, T. A., & Grawe, S. J. (2014). Non-response bias assessment in logistics survey research: Use fewer tests? *International Journal of Physical Distribution & Logistics Management*, *44*(5), 412–426.

Connell, K. Y. H., & Kozar, J. M. (2017). Introduction to special issue on sustainability and the triple bottom line within the global clothing and textiles industry. *Fashion and Textiles*, *4*(1), 16–23.

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research - A technological diffusion approach. *Management Science*, *36*(2), 123–139.

Dalvi-Esfahani, M., Ramayah, T., & Nilashi, M. (2017). Modelling upper echelons' behavioural drivers of Green IT/IS adoption using an integrated Interpretive Structural ModellingeAnalytic Network Process approach. *Telematics Inf.*, *34*(2), 583–603.

Daniel, J. (2011). *Sampling Essentials: Practical Guidelines for Making Sampling Choices* (Vol. 148). Sage Publications.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

De Brito, M. P., Carbone, V., & Blanquart, C. M. (2008). Towards a sustainable fashion retail supply chain in Europe: Organization and performance. *International Journal of Production Economics*, *114*(2), 534–553.

De Groot, J. I., & Steg, L. (2009). Morality and prosocial behavior: the role of awareness, responsibility, and norms in the norm activation model. *Journal of Social Psychology*, *149*(4), 425–449.

Denuwara, N., Maijala, J., & Hakovirta, M. (2019). Sustainability benefits of RFID technology in the apparel industry. *Sustainability (Switzerland)*, *11*(22), 1–14. https://doi.org/10.3390/su11226477

DeSimone, J. A., Harms, P. D., & DeSimone, A. J. (2015). Best practice recommendations for data screening. *Journal of Organizational Behavior*, *36*(2), 171–181.

Desore, A., & Narula, S. A. (2018). An overview on corporate response towards sustainability issues in textile industry. *Environment, Development and Sustainability*, *20*(4), 1439–1459.

Dholakia, R., & Uusitalo, O. (2002). Switching to electronic stores: Consumer characteristics and the perception of shopping benefits. *International Journal of Retail and Distribution Management*, *30*(10), 459–469.

Díaz-Chao, Á., Ficapal-Cusí, P., & Torrent-Sellens, J. (2021). Environmental assets, industry 4.0 technologies and firm performance in Spain: A dynamic capabilities path to reward sustainability. *Journal of Cleaner Production*, *281*, 1–14. https://doi.org/10.1016/j.jclepro.2020.125264

Dickson, M. A. (1999). US consumers' knowledge of and concern with apparel sweatshops. *Journal of Fashion Marketing and Management*, *3*(1), 44–55. https://doi.org/10.1108/eb022547

Dickson, M. A. (2000). Personal values, beliefs, knowledge, and attitudes relating to intentions to purchase apparel from socially responsible businesses. *Clothing and Textiles Research Journal*, *18*(1), 19–30. https://doi.org/10.1177/0887302X0001800103

DiMaggio, P. J., & Powell, W. W. (1991). *The New Institutionalism and Organizational Analysis*. University of Chicago Press.

Dincer, I. (2000). Renewable energy and sustainable development: A crucial review. *Renewable and Sustainable Energy Reviews*, *4*(2), 157–175.

Ding, J. H., Chen, P. S., & Lyu, J. (2011). Evolutionary strategy to apply information and communication technology: A case study in the apparel industry. *Production Planning and Control*, *22*(3), 282–297.

Dutot, V. (2014). Adoption of social media using technology acceptance model: The generational effect. *International Journal of Technology and Human Interaction*, *10*(4), 18–35. https://doi.org/10.4018/ijthi.2014100102

Dwivedi, Y. K., Khan, N., & Papazafeiropoulou, A. (2007). Consumer adoption and usage of broadband in Bangladesh. *Electronic Government an International Journal*, *4*(3), 299–313.

Dziuban, C. D., & Shirkey, E. C. (1974). When is a correlation matrix appropriate for factor analysis? Some decision rules. *Psychological Bulletin*, *81*(6), 358–361.

El Alfy, S., Gómez, J. M., & Ivanov, D. (2017). Exploring instructors' technology readiness, attitudes and behavioral intentions towards e-learning technologies in Egypt and United Arab Emirates. *Education and Information Technologies*, *22*(5), 2605–2627. https://doi.org/10.1007/s10639-016-9562-1

Elkington, J. (2004). Enter the triple bottom line. In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does It All Add up?* (pp. 1–16). Earthscan.

Elliott, K. M., Hall, M. C., & Meng, J. (2013). Consumers' intention to use self-scanning technology: The role of technology readiness and perceptions toward self-service technology. *Academy of Marketing Studies Journal*, *17*(1), 129–144.

Emery, R. F. (1967). The relation of exports and economic growth. *Kyklos*, *20*(4), 470–486.

Enyoghasi, C., & Badurdeen, F. (2021). Industry 4.0 for sustainable manufacturing: Opportunities at the product, process, and system levels. *Resources, Conservation and Recycling*, *166*(December 2020). https://doi.org/10.1016/j.resconrec.2020.105362

Eriksson, L., Garvill, J., & Nordlund, A. M. (2006). Acceptability of travel demand management measures: the importance of problem awareness, personal norm, freedom, and fairness. *Journal of Environmental Psychology*, *26*(1), 15–26.

Export Promotion Bureau. (2021). *Export Promotion Bureau of Bangladesh*. http://www.epb.gov.bd/

Export Promotion Bureau of Bangladesh. (2022). *Export Promotion Bureau of Bangladesh-Government of the People's Republic of Bangladesh*. http://www.epb.gov.bd/

Faisal, M. N. (2010). Sustainable supply chains: A study of interaction among the enablers. *Business Process Management Journal*, *16*, 508–529.

Farra, E. (2019). *5 Takeaways from Last Night's Future of Fashion Sustainability Panel*. www.vogue.com/article/fast-fashion-environmental-impact-sustainability-parsons-zady

Ferri, L., Spanò, R., Ginesti, G., & Theodosopoulos, G. (2020). Ascertaining auditors' intentions to use blockchain technology: evidence from the Big 4 accountancy firms in Italy. *Meditari Accountancy Research*, *29*(5), 1063–1087. https://doi.org/10.1108/MEDAR-03-2020-0829

Fink, A., & Litwin, M. S. (1995). *How to Measure Survey Reliability and Validity*. Sage Publications.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley.

Foroozanfar, M., Sepasgozar, S. M. E., & Arbabi, H. (2017). An empirical investigation on construction companies' readiness for adopting sustainable technology. *ISARC 2017 - Proceedings of the 34th International Symposium on Automation and Robotics in Construction*, *August*, 925–936. https://doi.org/10.22260/isarc2017/0129

Fowler Jr, F. J. (2013). *Survey Research Methods*. Sage Publications.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach Pitman* (Pitman ser).

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & De Colle, S. (2010). *Stakeholder Theory: State of the Art*. Cambridge University Press.

Frondel, M., Horbach, J., & Rennings, K. (2007). End-of-pipe or cleaner production? An empirical comparison of environmental innovation decisions across OECD countries. *Business Strategy and the Environment*, *16*(8), 571–584.

Fu, K., R.A., D., B., Ligthart, P. E., & Van Riel, A. C. (2018). Factors affecting sustainable process technology adoption: A systematic literature review. *Journal of Cleaner Production*, *205*(1), 226–251.

Fu, Y., Kok, R. A. W., Dankbaar, B., Ligthart, P. E. M., & van Riel, A. C. R. (2018). Factors affecting sustainable process technology adoption: A systematic literature review. *Journal of Cleaner Production*, *205*(1), 226–251. https://doi.org/10.1016/j.jclepro.2018.08.268

Fuller, C. M., Simmering, M. J., Atinc, G., Atinc, Y., & Babin, B. J. (2016). Common methods variance detection in business research. *Journal of Business Research*, *69*(8), 3192–3198. https://doi.org/10.1016/j.jbusres.2015.12.008

Gao, J., Ren, L., Yang, Y., Zhang, D., & Li, L. (2022). The impact of artificial intelligence technology stimuli on smart customer experience and the moderating effect of technology readiness. *International Journal of Emerging Markets*, *17*(4), 1123–1142. https://doi.org/10.1108/IJOEM-06-2021-0975

Gerasimova, K. (2017). Our common future. In *The Brundtland Report: Our Common Future*. Oxford University Press. https://doi.org/10.4324/9781912281220

Ghisetti, C., & Rennings, K. (2014). Environmental innovations and profitability: How does it pay to be green? An empirical analysis on the German innovation survey. *Journal of Cleaner Production*, *75*, 106–117.

Gilly, M. C., Celsi, M. W., & Schau, H. J. (2012). It don't come easy: Overcoming obstacles to technology use within a resistant consumer group. *Journal of Consumer Affairs*, *46*(1), 62–89.

Goodland, R. (1995). The concept of environmental sustainability. *Annual Review of Ecology and Systematics*, *26*(1), 1–24.

Goutam, D., Ganguli, S., & Gopalakrishna, B. V. (2022). Technology readiness and e-service quality – impact on purchase intention and loyalty. *Marketing Intelligence and Planning*, *40*(2), 242–255. https://doi.org/10.1108/MIP-06-2021-0196

Grieco, A., Caricato, P., Gianfreda, & Voglino, A. (2017). An industry 4.0 case study in fashion manufacturing. *Procedia Manufacturing*, *11*, 871–877.

Groves, R., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey Methodology* (2nd ed.). Wiley.

Groves, R. M., & Peytcheva, E. (2008). The impact of nonresponse rates on nonresponse bias: A meta-analysis. *Public Opinion Quarterly*, *72*(2), 167–189.

Gupta, H., Kumar, A., & Wasan, P. (2021). Industry 4.0, cleaner production and circular economy: An integrative framework for evaluating ethical and sustainable business performance of manufacturing organizations. *Journal of Cleaner Production*, *295*. https://doi.org/10.1016/j.jclepro.2021.126253

Hair, J. F. (2009). *Multivariate Data Analysis: A Global Perspective* (7th ed.). Prentice Hall.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2015). *Multivariate Data Analysis* (7th ed.). Pearson Higher Education.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hayes, A. F. (2012). *PROCESS: A versatile computational tool for observed variable mediation, mod_eration, and conditional process modeling [White paper]*. http://www.afhayes.com/public/process2012.pdf

Heiskanen, E., Kasanen, P., & Timonen, P. (2005). Consumer participation in sustainable technology development. *International Journal of Consumer Studies*, *29*, 98–107.

Hilgard, E. R., & Bower, G. H. (1975). *Theories of Learning*. Prentice Hall.

Hiller Connell, C., & Kozar, J. M. (2017). Introduction to special issue on sustainability and the triple bottom line within the global clothing and textiles industry. *Fashion and Textiles*, *4*(1), 16–23.

Hinds, B., McCartney, J., Hadden, C., & Diamond, J. (1992). 3D CAD for garment design. *International Journal of Clothing Science and Technology*, *4*(4), 6–14.

Hodges, N. J., & Link, A. N. (2017). *Knowledge-intensive entrepreneurship: An analysis of European textile and apparel firms*. Springer.

Hodges, N., Karpova, E., & Lentz, H. (2010). An investigation of women's early career experiences in the textile and apparel industries. *Family and Consumer Sciences Research Journal*, *39*(1), 75–89.

Hoffman, D. L., Novak, T. P., & Peralta, M. (1999). Building consumer trust online: How merchants can win back lost consumer trust in the interest of e-commerce sales. *Communications of the ACM*, *42*(4), 80–85.

Hoque, M. A., Rasiah, R., Furuoka, F., & Kumar, S. (2021). Technology adoption in the apparel industry: Insight from literature review and research directions. *Research Journal of Textile and Apparel*. https://doi.org/10.1108/RJTA-08-2020-0090

Hoque, M. A., Rasiah, R., Furuoka, F., & Kumar, S. (2022). Critical determinants and firm performance of sustainable technology adoption in the apparel industry: the stakeholder approach. *Journal of Fashion Marketing and Management*. https://doi.org/10.1108/JFMM-06-2021-0147

Hossain, L., Sarker, S. K., & Khan, M. S. (2018). Evaluation of present and future wastewater impacts of textile dyeing industries in Bangladesh. *Environmental Development*, *26*, 23–33.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, *20*(2), 195–204.

Huo, B., Tian, M., Zhang, Q., & Tian, Y. (2019). The dilemma of inter-organizational relationships: Dependence, use of power and their impacts on opportunism. *International Journal of Operations and Production Management*, *39*(1), 2–23.

Hussain, A., Tyagi, G., & Peng, S. L. (2022). *IoT and AI Technologies for Sustainable Living: A Practical Handbook*. CRC Press.

Igbaria, M., & Parasuraman, S. (1989). A path analytic study of individual characteristics, computer anxiety and attitudes towards microcomputers. *Journal of Management*, *15*(3), 373–388.

IGI Global. (2021). *What is technology adoption | IGI Global*. https://www.igi-global.com/dictionary/understanding-users-intention-to-use-mobile-services-from-the-perspective-of-lifestyle/29488

Iqbal, M. A., & Su, J. (2022). Apparel professionals' perception of sustainability-related technology: Empirical evidence from Bangladesh. *International Textile and Apparel Association Annual Conference Proceedings*, *79(1)*. https://doi.org/10.31274/itaa.15851

Iqbal, M. A., & Su, J. (2021). Technology adoption in the apparel industry of Bangladesh: A qualitative case study. *International Textile and Apparel Association Annual Conference Proceedings*, *78*(1). https://doi.org/https://doi.org/10.31274/itaa.13553

Iqbal, M. A., Su, J., & Hasan, S. (2022). Skill and knowledge requirements of entry-level logistics professionals in the apparel industry of Bangladesh: An importance-expertise matrix analysis. *International Journal of Fashion Design, Technology and Education*, *15*(1), 45–56. https://doi.org/10.1080/17543266.2021.1992514

Irani, Z., Dwivedi, Y. K., & Williams, M. D. (2009). Understanding consumer adoption of broadband: An extension of the technology acceptance model. *The Journal of the Operational Research Society*, *60*(10), 1322–1334. https://doi.org/10.1057/jors.2008. 100.

Islam, M. M., Khan, A. M., & Islam, M. M. (2013a). Application of lean manufacturing to higher productivity in the apparel industry in Bangladesh. *International Journal of Scientific and Engineering Research*, *4*(2), 1–10.

Islam, M. M., Khan, A. M., & Islam, M. M. (2013b). Textile industries in Bangladesh and challenges of growth. *Research Journal of Engineering Sciences*, *2*(2), 31–37. https://www.researchgate.net/profile/Md_Mazedul_Islam/publication/236839094_Textile_Industries_in_Bangladesh_and_Challenges_of_Growth/links/02e7e5194a64e4243b000000/Textile-Industries-in-Bangladesh-and-Challenges-of-Growth.pdf

Islam, M. M., Perry, P., & Gill, S. (2021). Mapping environmentally sustainable practices in textiles, apparel and fashion industries: a systematic literature review. *Journal of Fashion Marketing and Management*, *November*. https://doi.org/10.1108/JFMM-07-2020-0130

Islam, M. S. (2021). Ready-made garments exports earning and its contribution to economic growth in Bangladesh. *GeoJournal*, *86*(3), 1301–1309. https://doi.org/10.1007/s10708-019-10131-0

Islam, R. M., & Adnan, A. (2016). Ready-made garments sector of Bangladesh: Its contribution and challenges towards development. *Asian Development Studies*, *5*(2), 50–61.

Jaafar, M., Ramayah, T., Abdul-Aziz, A. R., & Saad, B. (2007). Technology readiness among managers of Malaysian construction firms. *Engineering, Construction and Architectural Management*, *14*(2), 180–191. https://doi.org/10.1108/09699980710731290

Jacobs, B., & Karpova, E. (2020). Skills and knowledge for merchandising professionals: The case of the South African apparel retail industry. *Clothing and Textiles Research Journal*, 1–18. https://doi.org/10.1177/0887302X20935516

Jacobs, B. W., & Singhal, V. R. (2017). The effect of the Rana Plaza disaster on shareholder wealth of retailers: Implications for sourcing strategies and supply chain governance. *Journal of Operations Management*, *49–51*, 52–66. https://doi.org/10.1016/j.jom.2017.01.002

Jarvenpaa, S. L., & Ives, B. (1991). Executive involvement and participation in the management of information technology. *MIS Quarterly: Management Information Systems*, *15*(2), 205–223. https://doi.org/10.2307/249382

Jayatilake, H., & Withanaarachchi, A. S. (2016). Industry 4.0 in the apparel-manufacturing sector: Opportunities for Sri Lanka. *1st Interdisciplinary Conference of Management Researchers*.

Jenkin, T. A., Webster, J., & McShane, L. (2011). An agenda for 'Green' information technology and systems research. *Information and Organization*, *21*(1), 17–40.

Jin, B. (2006). Performance implications of information technology implementation in an apparel supply chain. *Supply Chain Management: An International Journal*, *11*(4), 309–316.

Kabir, S. M. F., Chakraborty, S., Hoque, S. M. A., & Mathur, K. (2019). Sustainability assessment of cotton-based textile wet processing. *Clean Technologies*, *1*(1), 232–246.

Kaiser, H. F. (1963). Image Analysis. In C. W. Harris (Ed.), *Problems in Measuring Change*. University of Wisconsin Press.

Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the Blockchain technology adoption in supply chains-Indian context. *International Journal of Production Research*, *57*(7), 2009–2033. https://doi.org/10.1080/00207543.2018.1518610

Kang, J., Liu, C., & Kim, S. H. (2013). Environmentally sustainable textile and apparel consumption: The role of consumer knowledge, perceived consumer effectiveness and perceived personal relevance. *International Journal of Consumer Studies*, *37*(4), 442–452. https://doi.org/10.1111/ijcs.12013

Kates, R. W. (2011). What kind of a science is sustainability science? *Proceedings of the National Academy of Sciences*, *108*(49), 19449–19450.

Kendall, M. S. (1957). *A Course in Multivariate Analysis*. Charles Griffin.

Khan, M. M. R., & Islam, M. M. (2015). Materials and manufacturing environmental sustainability evaluation of apparel product: knitted T-shirt case study. *Textiles and Clothing Sustainability*, *1*(1). https://doi.org/10.1186/s40689-015-0008-8

Khan, M. M. R., Mondal, M. I. H., & Uddin, M. Z. (2013). Sustainable washing for denim garments by enzymatic treatment. *Journal of Chemical Engineering*, *27*, 27–31.

Khin, S., & Mui Hung, D. K. (2022). Identifying the driving and moderating factors of Malaysian SMEs' readiness for Industry 4.0. *International Journal of Computer Integrated Manufacturing*, *00*(00), 1–19. https://doi.org/10.1080/0951192X.2022.2025619

Khurana, K., & Ricchetti, M. (2016). Two decades of sustainable supply chain management in the fashion business: An appraisal. *Journal of Fashion Marketing and Management*, *20*(1), 89–104.

Kidd, C. V. (1992). The evolution of sustainability. *Journal of Agricultural and Environmental Ethics*, *5*(1), 1–26.

Kim, T., & Chiu, W. (2019). Consumer acceptance of sports wearable technology: the role of technology readiness. *International Journal of Sports Marketing and Sponsorship*, *20*(1), 109–126. https://doi.org/10.1108/IJSMS-06-2017-0050

Klar, D., Frishammar, J., Roman, V., & Hallberg, D. (2016). A Technology Readiness Level scale for iron and steel industries. *Ironmaking and Steelmaking*, *43*(7), 494–499. https://doi.org/10.1080/03019233.2015.1109024

Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: A systematic review. *Journal of Cleaner Production*, *65*, 57–75.

Kline, R. B. (2011). Convergence of structural equation modeling and multilevel modeling. In M. Williams & W. P. Vogt (Eds.), *The SAGE Handbook of Innovation in Social Research Methods*. SAGE Publications Ltd. https://doi.org/10.4135/9781446268261

Kline, R. B. (2016). *Principles and Practice of Structural Equation Modeling* (4th ed.). The Guilford Press.

Koksal, D., Strahle, J., Muller, M., & Freise, M. (2017). Social sustainable supply chain management in the textile and apparel industry- A literature review. *Sustainability*, *9*(1), 100.

Koltun, P. (2010). Materials and sustainable development. *Progress in Natural Science: Materials International*, *20*(16–29).

Kondratenko, Y., Korobko, O. V., & Kozlov, O. V. (2017). PLC-based systems for data acquisition and supervisory control of environment-friendly energy-saving technologies. In V. Kharchenko, Y. Kondratenko, & J. Kacprzyk (Eds.), *Green IT Engineering: Concepts, Models, Complex Systems Architectures* (pp. 247–267). Springer.

Koo, C., & Chung, N. (2014). Examining the eco-technological knowledge of Smart Green IT adoption behavior: A self-determination perspective. *Technological Forecasting and Social Change*, *88*, 140–155. https://doi.org/10.1016/j.techfore.2014.06.025

Krosnick, J. A. (1999). Survey research. *Annual Review of Psychology*, *50*(1), 537–567.

Kumar, V., Agrawal, T. K., Wang, L., & Chen, Y. (2017). Contribution of traceability towards attaining sustainability in the textile sector. *Textiles and Clothing Sustainability*, *3*(1), 5. https://doi.org/10.1186/s40689-017-0027-8

Kuo, Y. L. (2013). Technology readiness as moderator for construction company performance. *Industrial Management and Data Systems*, *113*(4), 558–572. https://doi.org/10.1108/02635571311322793

Kwak, H., Fox, R. J., & Zinkhan, G. M. (2002). What products can be successfully promoted and sold via the Internet? *Journal of Advertising Research*, *42*(1), 23–38.

Lage, A., & Ancutiene, K. (2017). Virtual try-on technologies in the clothing industry. Part 1: Investigation of distance ease between body and garment. *The Journal of the Textile Institute*, *108*(10), 1787–1793.

Lall, S. (1992). Technological capabilities and industrialization. *World Development*, *20*(2), 165–186.

Latour, M. S., Hanna, J. B., Miller, M. D., & Pitts, R. E. (2002). Consumer involvement with personal computer technology: A multi-sample analysis. *American Business Review*, *20*(2), 1–11. https://login.libproxy.uncg.edu/login?url=https://www.proquest.com/scholarly-journals/consumer-involvement-with-personal-computer/docview/216290736/se-2?accountid=14604

Lavrakas, P. J. (2008). *Encyclopedia of Survey Research Methods*. Sage Publications.

Lee, Y. H., Hsieh, Y. C., & Hsu, C. N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Education, Technology and Society*, *14*, 124–137.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems*, *12*(December). https://doi.org/10.17705/1cais.01250

Legnani, E., Cavalieri, S., Pinto, R., & Dotti, S. (2011). The potential of RFID technology in the textile and clothing industry: Opportunities, requirements and challenges. In D. C. Ranasinghe, Q. Z. Sheng, & S. Zeadally (Eds.), *Unique Radio Innovation for the 21st Century* (pp. 309–329). Springer.

Li, W. Y., Chow, P. S., Choi, T. M., & Chan. (2016). Supplier integration, green sustainability programs, and financial performance of fashion enterprises under global financial crisis. *Journal of Cleaner Production*, *135*, 57–70.

Li, Y. ., Zhao, X. ., Shi, D. ., & Li, X. (2014). Governance of sustainable supply chains in the fast fashion industry. *European Management Journal*, *32*, 823–836.

Liébana-Cabanillas, F., Marinkovic, V., Ramos de Luna, I., & Kalinic, Z. (2018). Predicting the determinants of mobile payment acceptance: A hybrid SEM-neural network approach. *Technological Forecasting and Social Change*, *129*(October 2017), 117–130. https://doi.org/10.1016/j.techfore.2017.12.015

Liljander, V., Gillberg, F., Gummerus, J., & van Riel, A. (2006). Technology readiness and the evaluation and adoption of self-service technologies. *Journal of Retailing and Consumer Services*, *13*(3), 177–191. https://doi.org/10.1016/j.jretconser.2005.08.004

Lin, J. S. C., & Chang, H. C. (2011). The role of technology readiness in self-service technology acceptance. *Managing Service Quality*, *21*(4), 424–444. https://doi.org/10.1108/09604521111146289

Lin, J. S. C., & Hsieh, P. L. (2007). The influence of technology readiness on satisfaction and behavioral intentions toward self-service technologies. *Computers in Human Behavior*, *23*(3), 1597–1615. https://doi.org/10.1016/j.chb.2005.07.006

Liu, J. H., Gao, W. D., Wang, H. B., Jiang, H. X., & Li, Z. X. (2010). Development of bobbin tracing system based on RFID technology. *The Journal of The Textile Institute*, *101*(10), 925–930. https://doi.org/10.1080/00405000903028299

Liu, K., Zeng, X., Bruniaux, P., Wang, J., Kamalha, E., & Tao, X. (2017). Fit evaluation of virtual garment try-on by learning from digital pressure data. *Knowledge-Based Systems*, *133*(19), 174–182.

Liu, Y. J., Zhang, D. L., & Yuen, M. M. F. (2010). A survey on CAD methods in 3D garment design. *Computers in Industry*, *61*(6), 576–593.

Lou, A., & Li, E. Y. (2017). Integrating innovation diffusion theory and the technology acceptance model: The adoption of blockchain technology from business managers' perspective. *ICEB Proceedings 4–8 December 2017*, 44.

Lu, S., Mok, P., & Jin, X. (2017). A new design concept: 3D to 2D textile pattern design for garments. *Computer-Aided Design*, *89*(1), 35–49.

Luken, R., & Van Rompaey, F. (2008). Drivers for and barriers to environmentally sound technology adoption by manufacturing plants in nine developing countries. *Journal of Cleaner Production*, *16*(1, Supplement 1), S67–S77. https://doi.org/https://doi.org/10.1016/j.jclepro.2007.10.006

Luo, J., Fan, M., & Zhang, H. (2012). Information technology and organizational capabilities: A longitudinal study of the apparel industry. *Decision Support Systems*, *53*(1), 186–194.

Lynne, G. D., Franklin Casey, C., Hodges, A., & Rahmani, M. (1995). Conservation technology adoption decisions and the theory of planned behavior. *Journal of Economic Psychology*, *16*(4), 581–598. https://doi.org/10.1016/0167-4870(95)00031-6

MacCarthy, L. (2019). *Canopy, Rainforest Alliance Launch First-Ever Audit for Rayon-Viscose Supply Chain*. https://sustainablebrands.com/read/supply-chain/canopy-rainforest-alliance-launch-first- ever-audit-for-rayon-viscose-supply-chain

Macchion, L., Da Giau, A., & Caniato, F. (2018). Strategic approaches to sustainability in fashion supply chain management. *Production Planning and Control*, *29*(1), 9–28.

Macedo, I. M. (2017). Predicting the acceptance and use of information and communication technology by older adults: An empirical examination of the revised UTAUT2. *Computers in Human Behavior*, *75*, 935–948. https://doi.org/10.1016/j.chb.2017.06.013

Maduku, D. K., Mpinganjira, M., & Duh, H. (2016). Understanding mobile marketing adoption intention by South African SEMs: A multi-perspective framework. *International Journal of Information Management*, *36*(5), 711–723.

Mahendrati, H. A., & Mangundjaya, W. (2020). Individual readiness for change and affective commitment to change: The mediation effect of technology readiness on public sector. *Advances in Social Science, Education and Humanities Research*, *431*, 52–59. https://doi.org/10.2991/assehr.k.200407.010

Marangunić, N., & Granić, A. (2015). Technology acceptance model: A literature review from 1986 to 2013. *Universal Access in the Information Society*, *14*(1), 81–95. https://doi.org/10.1007/s10209-014-0348-1

Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal OfInformation Management*, *34*(1), 1–13.

Martins, R., Oliveira, T., & Thomas, M. A. (2016). An empirical analysis to assess the determinants of SaaS diffusion in firms. *Computers in Human Behavior*, *62*, 19–33.

Mathieson, K. (1991). Predicting user intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior. *Information Systems Research*, *2*(3), 173–191.

Mayer, J., Seekamp, E., Casper, J., & Blank, G. (2015). An examination of behavior change theories to predict behavioral intentions of organisms-in-trade hobbyists. *Human Ecology Review*, *21*(2), 65–92.

Meng, Y., Mok, P. Y., & Jin, X. (2012). Computer aided clothing pattern design with 3D editing and pattern alteration. *Computer-Aided Design*, *44*(8), 721–734.

Meuter, M. L., Bitner, M. J., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing*, *69*(2), 61–83.

Mishra, D., Akman, I., & Mishra, A. (2014). Theory of reasoned action application for green information technology acceptance. *Computers in Human Behavior*, *36*, 29–40. https://doi.org/10.1016/j.chb.2014.03.030

Moore, G. C. ., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192–222.

Moore, G. C., & Benbasat, I. (1996). Integrating diffusion of innovations and theory of reasoned action models to predict utilization of information technology by end-users. In *Diffusion and Adoption of Information Technology* (pp. 132–146). Springer.

Moore, M., & Fairhurst, A. (2003). Marketing capabilities and firm performance in fashion retailing. *Journal of Fashion Marketing and Management: An International Journal*, *7*(4), 386–397. https://doi.org/10.1108/13612020310496976

Morana, R., & Seuring, S. (2011). A three level framework for closed-loop supply chain management—Linking society, chain and actor level. *Sustainability*, *3*, 678–691.

Morris, M. G., Venkatesh, V., & Ackerman, P. L. (2005). Gender and age differences in employee decisions about new technology: An extension to the theory of planned behavior. *IEEE Transactions on Engineering Management*, *52*(1), 69–84. https://doi.org/10.1109/TEM.2004.839967

Mummalaneni, V., Meng, J. (Gloria), & Elliott, K. M. (2016). Consumer technology readiness and E-service quality in E-tailing: What is the impact on predicting online purchasing? *Journal of Internet Commerce*, *15*(4), 311–331. https://doi.org/10.1080/15332861.2016.1237232

Musyaffi, A. M., Mulyani, S., & Suraida, I. (2021). Lack of readiness of digital banking channel acceptance: Study on TAM 3 and technology readiness. *Academy of Strategic Management Journal*, *20*(Special Issue 4), 1–18.

Muthukumarana, T. T., Karunathilake, H. P., Punchihewa, H. K. G., Manthilake, M. M. I. D., & Hewage, K. N. (2018). Life cycle environmental impacts of the apparel industry in Sri Lanka: Analysis of the energy sources. *Journal of Cleaner Production*, *172*, 1346–1357.

Nath, S. D., Khayer, A., Majumder, J., & Barua, S. (2022). Factors affecting blockchain adoption in apparel supply chains: does sustainability-oriented supplier development play a moderating role? *Industrial Management and Data Systems*, *122*(5), 1183–1214. https://doi.org/10.1108/IMDS-07-2021-0466

Nayak, R. (2019). *Radio Frequency Identification (RFID) Technology and Application in Fashion and Textile Supply Chain*. CRC Press.

Nayak, R., Padhye, R., Wang, L., Chatterjee, K., & Gupta, S. (2015). The role of mass customisation in the apparel industry. *International Journal of Fashion Design, Technology and Education*, *8*(2), 162–172.

Nazim, N. F., Razis, N. M., & Hatta, M. F. M. (2021). Behavioural intention to adopt blockchain technology among bankers in islamic financial system: perspectives in Malaysia. *Romanian Journal of Information Technology and Automatic Control*, *31*(1), 11–28. https://doi.org/10.33436/v31i1y202101

Newsted, P., Huff, S., & Munro, M. (1998). Survey instruments in information systems. *MIS Quarterly*, *1998*(December), 553–554.

Niinimaki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). The environmental price of fast fashion. *Nature Reviews Earth and Environment*, *1*(4), 189–200.

Noppers, E. H., Keizer, K., Bolderdijk, J. W., & Steg, L. (2014). The adoption of sustainable innovations: Driven by symbolic and environmental motives. *Global Environmental Change*, *25*, 52–62.

Norman, F., & Alamsjah, F. (2020). Key factors to promote industry 4.0 readiness at Indonesian textile and clothing firm. *Engineering, Mathematics and Computer Science (EMACS) Journal*, *2*(2), 73–83. https://doi.org/10.21512/emacsjournal.v2i2.6448

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Sciences Education*, *15*(5), 625–632.

Nuryyev, G., Wang, Y. P., Achyldurdyyeva, J., Jaw, B. S., Yeh, Y. S., Lin, H. T., & Wu, L. F. (2020). Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: An empirical study. *Sustainability (Switzerland)*, *12*(3). https://doi.org/10.3390/su12031256

O'Cass, A. (2004). Fashion clothing consumption: Antecedents and consequences of fashion clothing involvement. *European Journal of Marketing*, *38*(7), 869–882.

O'cass, A., & Fenech, T. (2003). Web retailing adoption: Exploring the nature of internet users Web retailing behavior. *Journal of Retailing and Consumer Services*, *10*(2), 81–94.

Oliveira, & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data System*, *110*(9), 1337–1354.

Oliveira Neto, G. C., Ferreira Correia, J. M., & Silva, P. C. (2019). Cleaner production in the textile industry and its relationship to sustainable development goals. *Journal of Cleaner Production*, *228*, 1514–1525.

Oliveira, T., & Martins, M. F. O. (2011). Understanding the determinant factors of internet business solutions adoption: The case of Portuguese firms. *Applied Economics Letters*, *18*, 1769–1775.

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior*, *61*, 404–414.

Oliveira, Tiago, & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal of Information Systems Evaluation*, *14*(1), 110–121.

OTEXA. (2022). *Office of Textiles and Apparel*. https://otexa.trade.gov/msrpoint.htm

Ozturk, E., Koseoglu, H., & Karaboyaci. (2016). Sustainable textile production: Cleaner production assessment/eco-efficiency analysis study in a textile mill. *Journal of Cleaner Production*, *138*, 248–263.

Ozusaglam, S., Kesidou, E., & Wong, C. Y. (2018). Performance effects of complementarity between environmental management systems and environmental technologies. *International Journal of Production Economics*, *197*, 112–122.

Papahristou, E., & Bilalis, N. (2017). Should the fashion industry confront the sustainability challenge with 3D prototyping technology? *International Journal of Sustainable Engineering*, *10*(4/5), 207–214.

Parasuraman, A. (2000). Technology Readiness Index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Parasuraman, A., & Colby, C. L. (2015). An updated and streamlined technology readiness index : TRI 2.0. *Journal of Service Research*, *18*(1), 59–74. https://doi.org/10.1177/1094670514539730

Park-Poaps, H., Bari, M. S., & Sarker, Z. W. (2020). Bangladeshi clothing manufacturers' technology adoption in the global free trade environment. *Journal of Fashion Marketing and Management*. https://doi.org/10.1108/JFMM-06-2020-0119

Park, K. O. (2020). A study on sustainable usage intention of blockchain in the big data era: Logistics and supply chain management companies. *Sustainability (Switzerland)*, *12*(24), 1–15. https://doi.org/10.3390/su122410670

Patil, P., Tamilmani, K., Rana, N. P., & Raghavan, V. (2020). Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal. *International Journal of Information Management*, *54*(102144). https://doi.org/10.1016/j.ijinfomgt.2020.102144

Pavlou, P. A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption : An extension of the theory of planned behavior. *MIS Quarterly*, *30*(1), 115–143.

Peter, J. P. (1979). Reliability: A review of psychometric basics and recent marketing practices. *Journal of Marketing Research*, *16*(1), 6. https://login.libproxy.uncg.edu/login?url=https://www.proquest.com/scholarly-journals/reliability-review-psychometric-basics-recent/docview/1297376059/se-2?accountid=14604

Peter, J. P. (1981). Construct validity: A review of basic issues and marketing practices. *Journal of Marketing Research*, *18*(2), 133. https://login.libproxy.uncg.edu/login?url=https://www.proquest.com/scholarly-journals/construct-validity-review-basic-issues-marketing/docview/1297341548/se-2?accountid=14604

Pham, N., Coomer, T., Lane, P., Limbu, Y. B., Williamson, S., & Pham, L. (2020). Technology readiness and purchase intention: Role of perceived value and online satisfaction in the context of luxury hotels. *International Journal of Management and Decision Making*, *19*(1), 1. https://doi.org/10.1504/ijmdm.2020.10025698

Pimentel, D. (2005). Environmental and economic costs of the application of pesticides primarily in the United States. *Environment, Development and Sustainability*, *7*, 229–252.

Porter, C. E., & Donthu, N. (2006). Using the technology acceptance model to explain how attitudes determine internet usage: The role of perceived access barriers and demographics. *Journal of Business Research*, *59*(9), 999–1007.

Porter, M. E., & van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, *9*(4), 97–118.

Pradhan, M. K., Oh, J., & Lee, H. (2018). Understanding travelers' behavior for sustainable smart tourism: A technology readiness perspective. *Sustainability (Switzerland)*, *10*(11), 1–20. https://doi.org/10.3390/su10114259

Purnomo, R. A., Sarungu, J. J., Samudro, B. R., & Mulyaningsih, T. (2021). The dynamics of technology adoption readiness of micro, small, and medium enterprises and affecting characteristics: The experience from Indonesia. *Review of International Geographical Education Online*, *11*(3), 834–854. https://doi.org/10.33403/rigeo.800532

Qasem, Z. (2021). The effect of positive TRI traits on centennials adoption of try-on technology in the context of E-fashion retailing. *International Journal of Information Management*, *56*(March 2020), 102254. https://doi.org/10.1016/j.ijinfomgt.2020.102254

Queiroz, M. M., & Fosso Wamba, S. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management*, *46*(November 2018), 70–82. https://doi.org/10.1016/j.ijinfomgt.2018.11.021

Queiroz, M. M., Fosso Wamba, S., De Bourmont, M., & Telles, R. (2021). Blockchain adoption in operations and supply chain management: empirical evidence from an emerging economy. *International Journal of Production Research*, *59*(20), 6087–6103. https://doi.org/10.1080/00207543.2020.1803511

Rahman, M. M., & Haque, M. M. (2016). Investigation of fabric wastages in knit t-shirt manufacturing industry in Bangladesh. *International Journal of Research in Engineering and Technology*, *5*(10), 212–215.

Rahman, O., & Gong, M. (2016). Sustainable practices and transformable fashion design – Chinese professional and consumer perspectives. *International Journal of Fashion Design, Technology and Education*, *9*(3), 233–247. https://doi.org/10.1080/17543266.2016.1167256

Ram, S. (1987). A model of innovation resistance. *Advances in Consumer Research*, *14*(1), 208–212.

Ramayah, T., Mohamad, O., Omar, A., Malliga, M., & Leen, J. Y. A. (2013). Determinants of technology adoption among Malaysian SMEs: An IDT perspective. *Journal of ICT*, *12*, 103–119.

Rasiah, R. (2006). Ownership, technological intensities, and economic performance in South Africa. *International Journal of Technology Management*, *36*(1/2/3), 166–189.

Rasiah, R. (2007). Export orientation and technological intensities in auto parts firms in East and Southeast Asia: Does ownership matter? *Asian Economic Papers*, *6*(2), 55–76.

Raykov, T., & Marocoulides, G. A. (2006). *A First Course in Structural Equation Modeling* (2nd ed.). Lawrence Erlbaum Associates.

Rehman, T., McKemey, K., Yates, C. M., Cooke, R. J., Garforth, C. J., Tranter, R. B., Park, J. R., & Dorward, P. T. (2007). Identifying and understanding factors influencing the uptake of new technologies on dairy farms in SW England using the theory of reasoned action. *Agricultural Systems*, *94*(2), 281–293. https://doi.org/10.1016/j.agsy.2006.09.006

Reynolds, S., Cotrino, F., Ifedi, C., & Donthu, N. (2020). An exploratory study of executive factors that lead to technology adoption in small businesses. *Journal of Small Business Strategy*, *30*(2), 1–16.

Richins, M. L., & Bloch, P. H. (1986). After the new wears off: The temporal context of product involvement. *Journal of Consumer Research*, *13*(2), 280–285.

Rodan, S., & Galunic, C. (2004). More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal*, *25*(6), 541–562.

Rogers, E. M. (1983). *Diffusion of Innovations* (3rd ed.). The Free Press.

Rogers, E. M. (1995). *Diffusion of Innovations*. The Free Press.

Rogers, E. M. (2003). *The Diffusion of Innovations: Diffusion of Innovations*. New York Free Press.

Rojas-Méndez, J. I., Parasuraman, A., & Papadopoulos, N. (2017). Demographics, attitudes, and technology readiness: A cross-cultural analysis and model validation. *Marketing Intelligence and Planning*, *35*(1), 18–39. https://doi.org/10.1108/MIP-08-2015-0163

Roy, S., & Moorthi, Y. L. R. (2017). Technology readiness, perceived ubiquity and M-commerce adoption: The moderating role of privacy. *Journal of Research in Interactive Marketing*, *11*(3), 268–295. https://doi.org/10.1108/JRIM-01-2016-0005

Sayem, A. S. M., Kennon, R., & Clarke, N. (2010). 3D CAD systems for the clothing industry. *International Journal of Fashion Design, Technology and Education*, *3*(2), 45–53.

Schiederig, T., Tietze, F., & Herstatt, C. (2012). Green innovation in technology and innovation management - An exploratory literature review. *R&d Management*, *42*(2), 180–192.

Schumacker, R. E., & Lomax, R. G. (2004). *A Beginner's Guide to Structural Equation Modeling* (2nd ed.). Lawrence Erlbaum Associates.

Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and Business Cycle*. Harvard University Press.

Scott, W. R. (2005). Institutional theory: Contributing to a theoretical research program. *Great Minds in Management: The Process of Theory Development*, *37*(2), 460–484.

SDGS. (2022). *The 17 Goals | Sustainable Development*. https://sdgs.un.org/goals

Shen, B. (2014). Sustainable fashion supply chain: Lessons from H&M. *Sustainability (Switzerland)*, *6*(9), 6236–6249. https://doi.org/10.3390/su6096236

Shen, B., Li, Q., Dong, C., & Perry, P. (2017). Sustainability issues in textile and apparel supply chains. *Sustainability (Switzerland)*, *9*(9). https://doi.org/10.3390/SU9091592

Shen, B., Zheng, J. H., Chow, P. S., & Chow, K. Y. (2014). Perception of fashion sustainability in online community. *The Journal of the Textile Institute*, *105*(9), 971–979.

Shih, Y. Y., & Fang, K. (2004). The use of a decomposed theory of planned behavior to study internet banking in Taiwan. *Internet Research*, *14*(3), 213–223. https://doi.org/10.1108/10662240410542643

Shin, H., Collier, D. A., & Wilson, D. D. (2000). Supply management orientation and supplier/buyer performance. *Journal of Operations Management*, *18*(3), 317–333.

Shirahada, K., Ho, B. Q., & Wilson, A. (2019). Online public services usage and the elderly: Assessing determinants of technology readiness in Japan and the UK. In *Technology in Society* (Vol. 58, p. 101115). https://doi.org/10.1016/j.techsoc.2019.02.001

Shirvanimoghaddam, K., Motamed, B., Ramakrishna, S., & Naebe, M. (2020). Death by waste: Fashion and textile circular economy case. *The Science of the Total Environment*, *718*, 137317–137326.

Shrivastava, P. (1995). Environmental technologies and competitive advantage. *Strategic Management Journal*, *16*, 183–200.

Sikdar, S. K. (2003). Sustainable development and sustainability metrics. *AIChE Journal*, *49*(8), 1928–1932. https://doi.org/10.1002/aic.690490802

Simmons, D., & Widmar, R. (1990). Motivations and barriers to recycling: Toward a strategy for public education. *Journal of Environmental Education*, *22*, 13–18.

Soares, A. L. V., Mendes-Filho, L., & Gretzel, U. (2020). Technology adoption in hotels: Applying institutional theory to tourism. *Tourism Review*, *May*. https://doi.org/10.1108/TR-05-2019-0153

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, *70*(1), 65–94.

Spinelli, R., Dyerson, R., & Harindranath, G. (2013). IT readiness in small firms. *Journal of Small Business and Enterprise Development*, *20*(4), 807–823. https://doi.org/10.1108/JSBED-01-2012-0012

Stanford, A. W., Arnold, M. J., Magnusson, P., Zdravkovic, S., & Zhou, J. X. (2009). Technology readiness and usage: A global identity perspective. *Journal of the Academy of Marketing Science*, *37*(3), 250–265.

Statista. (2021). *Share in world exports of the leading clothing exporting countries 2021*. https://www.statista.com/statistics/1094515/share-of-the-leading-global-textile-clothing-by-country/

Su, J., & Gargeya, V. B. (2012). Strategic sourcing, sourcing capability and firm performance in the US textile and apparel industry. *Strategic Outsourcing: An International Journal*, *5*(2), 145–165. https://doi.org/10.1108/17538291211257592

Su, J., Hodges, N. N., Wu, H. (Jeff), & Iqbal, M. A. (2022a). Coping with the COVID-19 pandemic: evidence from the apparel industry in Bangladesh and China. *Journal of Fashion Marketing and Management: An International Journal*, *ahead-of-p*(ahead-of-print), 1–19. https://doi.org/10.1108/JFMM-08-2021-0213

Su, J., Hodges, N. N., Wu, H. (Jeff), & Iqbal, M. A. (2022b). Exploring sustainable sourcing in the apparel industry: Perspectives from Bangladesh and China. *International Textile and Apparel Association Annual Conference Proceedings*, *78*(1), 1–3. https://doi.org/10.31274/itaa.13578

Su, J., Hodges, N., Wu, H., & Iqbal, M. A. (2022c). Rethinking global textile and apparel supply chain management: Considering the impact of the COVID-19 pandemic. *International Textile and Apparel Association Annual Conference Proceedings*. https://doi.org/10.31274/itaa.13577

Su, J., Iqbal, M. A., Haque, F., & Akter, M. M. K. (2023). Sustainable apparel: A perspective from Bangladesh's young consumers. *Social Responsibility Journal*. https://doi.org/10.1108/SRJ-01-2022-0035

Sun, H., & Zhang, P. (2006). The role of moderating factors in user technology acceptance. *International Journal of Human Computer Studies*, *64*(2), 53–78.

Sun, J. (2016). Tool choice in innovation diffusion: A human activity readiness theory. *Computers in Human Behavior*, *59*, 283–294. https://doi.org/10.1016/j.chb.2016.02.014

Sun, L., & Zhao, L. (2017). Envisioning the era of 3D printing: A conceptual model for the fashion industry. *Fashion and Textiles*, *4*(1), 1–16.

Susitha, S. D. E. (2021). Influencing factors of employee readiness to adopt advanced manufacturing technology (AMT) on apparel shop floor in Sri Lanka. *International Journal of Multidisciplinary*, *8*(Iii), 2021.

Sustainable Society Index. (2022). *Sustainable Society Index*. http://www.ssfindex.com

Swazan, I. S., & Das, D. (2022). Bangladesh's emergence as a ready-made garment export leader: An examination of the competitive advantages of the garment industry. *International*

Journal of Global Business and Competitiveness, *0123456789*. https://doi.org/10.1007/s42943-022-00049-9

Tajima, M. (2007). Strategic value of RFID in supply chain management. *Journal of Purchasing and Supply Management*, *13*(4), 261–273. https://doi.org/https://doi.org/10.1016/j.pursup.2007.11.001

Tao, X., & Bruniaux, P. (2013). Toward advanced three-dimensional modeling of garment prototype from draping technique. *International Journal of Clothing Science and Technology*, *25*(4), 266–283.

Tao, X., Chen, X., Zeng, X., & Koehl, L. (2018). A customized garment collaborative design process by using virtual reality and sensory evaluation on garment fit. *Computers and Industrial Engineering*, *115*(1), 683–695.

Taylor, S. A., Coluch, K., & Goodwin, S. (2020). Technology readiness in the e-insurance industry: An exploratory investigation and development of an agent technology e-consumption model. *Journal of Insurance Issues*, *25*(2), 142–165.

Teece, D., & Pisano, G. (2003). The dynamic capabilities of firms. In C. W. Holsapple (Ed.), *Handbook on Knowledge Management* (pp. 195–213). Springer.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533.

Tenakwah, E. S., Tenakwah, E. J., Amponsah, M., Eyaa, S., Boateng, E., & Okhawere, N. (2022). Adoption of sustainable technologies during crisis: Examining employees' perception and readiness across cultures. *Sustainability (Switzerland)*, *14*(8). https://doi.org/10.3390/su14084605

The World Bank. (2022). *Bangladesh Overview: Development news, research, data | World Bank*. https://www.worldbank.org/en/country/bangladesh/overview

Tidd, J. (2001). Innovation management in context: Environment, organization and performance. *International Journal of Management Reviews*, *3*(3), 169–183.

Todeschini, B. V., Cortimiglia, M. N., Callegaro-de-Menezes, D., & Ghezzi, A. (2017). Innovative and sustainable business models in the fashion industry: Entrepreneurial drivers, opportunities, and challenges. *Business Horizons*, *60*(6), 759–770.

Tornatzky, L., & Fleischer, M. (1990). *The process of technology innovation*. Lexington Books.

Tornatzky, L. G., & Klein, L. G. (1982). Innovation characteristics and innovation-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, *29*(1), 28–45.

Tripathi, S. (2018). Moderating effects of age and experience on the factors influencing the actual usage of cloud computing. *Journal of International Technology and Information Management*, *27*(2), 121.

Turan, A., Tunç, Ö., & Zehir, C. (2015). A theoretical model proposal : Personal innovativeness and user involvement as antecedents of Unified Theory of Acceptance and Use of Technology. *Social and Behavioral Sciences*, *210*, 43–51. https://doi.org/10.1016/j.sbspro.2015.11.327

Ullah, N., Al-Rahmi, W. M., Alzahrani, A. I., Alfarraj, O., & Alblehai, F. M. (2021). Blockchain technology adoption in smart learning environments. *Sustainability (Switzerland)*, *13*(4), 1–18. https://doi.org/10.3390/su13041801

Ullman, J. B., & Bentler, P. M. (2012). Structural equation modeling. In *Handbook of Psychology* (2nd ed.).

UNEP - UN Environment Programme. (2022). https://www.unep.org/

UNFCCC. (2021). *Fashion industry charter for climate action*. 1–7. https://unfccc.int/climate-action/sectoral-engagement/global-climate-action-in-fashion/fashion-industry-charter-for-climate-action

USGBC. (2022). *LEED project profiles | U.S. Green Building Council*. https://www.usgbc.org/projects?Search+Library=%22bangladesh%22

van Oorschot, J. A., Hofman, E., & Halman, J. I. (2018). A bibliometric review of the innovation adoption literature. *Technological Forecasting and Social Change*, *134*(9), 1–21.

Varukolu, V., & Park-Poaps, H. (2009). Technology adoption by apparel manufacturers in Tirupur town, India. *Journal of Fashion Marketing and Management*, *13*(2), 201–214.

Venkatesh, V., & Brown, S. A. (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. *MIS Quarterly*, *25*(1), 71.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly: Management Information Systems*, *36*(1), 157–178. https://doi.org/10.2307/41410412

Verma, S., & Chaurasia, S. (2019). Understanding the determinants of big data analytics adoption. *Information Resources Management Journal*, *32*(3), 1–26. https://doi.org/10.4018/IRMJ.2019070101

Volino, P., Cordier, F., & Magnenat-Thalmann, N. (2005). From early virtual garment simulation to interactive fashion design. *Computer-Aided Design*, *37*(6), 593–608.

Wadho, W., & Chaudhry, A. (2018). Innovation and firm performance in developing countries: The case of Pakistani textile and apparel manufacturers. *Research Policy*, *47*(7), 1283–1294. https://doi.org/https://doi.org/10.1016/j.respol.2018.04.007

Walczuch, R., Lemmink, J., & Streukens, S. (2007). The effect of service employees' technology readiness on technology acceptance. *Information and Management*, *44*(2), 206–215. https://doi.org/10.1016/j.im.2006.12.005

Wang, Y., So, K. K. F., & Sparks, B. A. (2017). Technology readiness and customer satisfaction with travel technologies: A cross-country investigation. *Journal of Travel Research*, *56*(5), 563–577.

Watchravesringkan, K., Hodges, N. N., Yurchisin, J., Hegland, J., Karpova, E., Marcketti, S., & Yan, R. N. (2013). Modeling entrepreneurial career intentions among undergraduates: An examination of the moderating role of entrepreneurial knowledge and skills. *Family and Consumer Sciences Research Journal*, *41*(3), 325–342.

Wejnert, B. (2002). Integrating models of diffusion of innovation: A conceptual framework. *Basic Income Studies*, *28*(1), 101–111.

Weng, H. H. R., Chen, J. S., & Chen, P. C. (2015). Effects of green innovation on environmental and corporate performance: A stakeholder perspective. *Sustainability (Switzerland)*, *7*(5), 4997–5026. https://doi.org/10.3390/su7054997

Weng, M. H., & Lin, C. Y. (2011). Determinants of green innovation adoption for small and medium-size enterprises (SMES). *African Journal of Business Management*, *5*(22), 9154–9163.

Wiarda, E. (1987). *Frostbelt Automation: The ITI Status Report on Great Lakes Manufacturing*. Industrial Technology Institute.

Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G. W. H., & Ooi, K. B. (2020). Time to seize the digital evolution: Adoption of blockchain in operations and supply chain management among Malaysian SMEs. In *International Journal of Information Management* (Vol. 52). https://doi.org/10.1016/j.ijinfomgt.2019.08.005

Wong, W., Leung, S., Guo, Z., Zeng, Z., & Mok, P. (2014). Intelligent apparel product cross-selling using radio frequency identification (RFID) technology for fashion retailing. In W. K. Wong & Z. X. Guo (Eds.), *Fashion Supply Chain Management Using Radio Frequency Identification (RFID)Technologies* (pp. 159–186). Woodhead Publishing, Elsevier.

World Bank. (2019). *World development indicators*. https://databank.worldbank.org/%0Adata/source/world-development-indicators#.

World Bank. (2022). *United States Textiles and Clothing Imports by country & region 2019 | WITS Data*. https://wits.worldbank.org/CountryProfile/en/Country/USA/Year/2019/TradeFlow/Import/Partner/all/Product/50-63_TextCloth

WTO. (2022). *International trade and tariff data*. World Trade Organigation. https://www.wto.org/english/res_e/statis_e/statis_e.htm

Xu, Y., Thomassey, S., & Zeng, X. (2018). AI for apparel manufacturing in big data era: A focus on cutting and sewing. In S. Thomassey & X. Zeng (Eds.), *Artificial Intelligence for Fashion Industry in the Big Data Era* (pp. 125–151). Springer.

Yan, H., & Fiorito, S. S. (2007). CAD/CAM diffusion and infusion in the US apparel industry. *Journal of Fashion Marketing and Management: An International Journal*, *11*(2), 238–245.

Yang, C. L., Lin, S. P., Chan, Y. H., & Sheu, C. (2010). Mediated effect of environmental management on manufacturing competitiveness: An empirical study. *International Journal of Production Economics*, *123*(1), 210–220.

Yang, C., Yan, S., Wang, J., & Xue, Y. (2022). Flow experiences and virtual tourism: The role of technological acceptance and technological readiness. *Sustainability (Switzerland)*, *14*(9), 1–18. https://doi.org/10.3390/su14095361

Yang, S., MR, A., Kaminski, J., & Pepin, H. (2018). Opportunities for industry 4.0 to support remanufacturing. *Applied Sciences*, *8*(7), 1–18.

Yi, Y., & Moon, R. H. (2021). Sustained use of virtual meeting platforms for classes in the post-coronavirus era: The mediating effects of technology readiness and social presence. *Sustainability (Switzerland)*, *13*(15). https://doi.org/10.3390/su13158203

Zeithaml, V. A., Parasuraman, A., & Malhotra, A. (2002). Service quality delivery through web sites: A critical review of extant knowledge. *Journal of the Academy of Marketing Science*, *30*(4), 362–376.

Zhang, B., & Kim, J. H. (2013). Luxury fashion consumption in China: Factors' affecting attitude and purchase intent. *Journal of Retailing and Consumer Services*, *20*(1), 68–79.

Zhang, C., & Dhaliwal, J. (2009). An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management. *International Journal of Production Economics*, *120*(1), 252–269. https://doi.org/10.1016/j.ijpe.2008.07.023

Zhang, M., Kong, X. X., & Ramu, S. C. (2016). The transformation of the clothing industry in China. *Asia Pacific Business Review*, *22*(1), 86–109.

Zhang, Y., Weng, Q., & Zhu, N. (2018). The relationships between electronic banking adoption and its antecedents: A meta-analytic study of the role of national culture. *International Journal of Information Management*, *40*(January), 76–87. https://doi.org/10.1016/j.ijinfomgt.2018.01.015

Zhang, Yali, Sun, J., Yang, Z., & Wang, Y. (2020). Critical success factors of green innovation: Technology, organization and environment readiness. *Journal of Cleaner Production*, *264*, 121701. https://doi.org/10.1016/j.jclepro.2020.121701

Zhu, K., Dong, S. T., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: Determinants of post-adoption digital transformation of European companies. *European Journal of Information Systems*, *15*(6), 601–616.

Zutin, G. C., Barbosa, G. F., de Barros, P. C., Tiburtino, E. B., Kawano, F. L. F., & Shiki, S. B. (2022). Readiness levels of Industry 4.0 technologies applied to aircraft manufacturing—a review, challenges and trends. *International Journal of Advanced Manufacturing Technology*, *120*(1–2), 927–943. https://doi.org/10.1007/s00170-022-08769-1

APPENDIX A: SURVEY INSTRUMENTS

Consent Form/UNCG Information Sheet

Project Title: Sustainable Technology Readiness of Apparel Professionals in Bangladesh

Principal Investigator: Md Arif Iqbal

Faculty Advisor: Dr. Jin Su

What is this all about?
I am asking you to participate in this research study because this study aims to investigate the issues related to apparel managers' technology readiness and adoption behavior toward sustainable technologies. This research project will only take about 15 minutes and will involve you in a survey. Your participation in this research project is voluntary.

How will this negatively affect me?
No, other than the time you spend on this project there are no known or foreseeable risks involved with this study.

What do I get out of this research project?
You and/or society will or might indirectly benefit from understanding the sustainable technology adoption behavior of apparel professionals.

Will I get paid for participating?
There is no compensation for participating.

What about my confidentiality?
We will do everything possible to make sure that your information is kept confidential. All information obtained in this study is strictly confidential unless disclosure is required by law. In the survey we will not ask for any identifying information. The survey information will be stored separately (following UNCG ITS recommendation).

The data will be collected through the online software, Qualtrics. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

What if I do not want to be in this research study?
You do not have to be part of this project. This project is voluntary and it is up to you to decide to participate in this research project. If you agree to participate at any time in this project you may stop participating without penalty.

What if I have questions?
You can ask Md. Arif Iqbal (m_iqbal3@uncg.edu) and Dr. Jin Su (j_su@uncg.edu) anything about the study. If you have concerns about how you have been treated in this study call the Office of Research Integrity Director at 1-855-251-2351.
If you feel you are not the right person to answer the type of questions, please forward the survey to an appropriate person.

By agreeing to continue with this survey, you are consenting to participate in this research study with the understanding that you are free to withdraw at any time. By consenting, you identify all your questions concerning this study have been answered and you confirm that you are at least 18 years of age and agree to participate in this study.

If you want to continue to the survey, please click on the "Consent" below:

- Consent
- I do not want to participate

Cover Letter/Recruitment Invitation/ UNCG Information Sheet

Project Title: Sustainable Technology Readiness of Apparel Professionals in Bangladesh
Principal Investigator: Md Arif Iqbal
Faculty Advisor: Dr. Jin Su

I am asking you to participate in this research study because this study aims to investigate the issues related to apparel managers' technology readiness and adoption behavior toward sustainable technologies. Research on sustainable technology adoption in the apparel industry is very important due to the sustainability impacts of this industry at the global level. Bangladesh has become one of the major apparel sourcing hubs in the global apparel business. We, researchers at the University of North Carolina at Greensboro, would like to make an in-depth investigation of apparel managers' perceptions of sustainable technology in the context of Bangladesh. Specifically, this study intends to investigate the relationships between managers' knowledge and involvement of technology and their readiness toward sustainable technology. The study also investigates the impacts of sustainable technology readiness and other factors on apparel managers' adoption intention toward sustainable technology.

This research project will only take about 15 minutes and will involve you in a survey. Your participation in this research project is voluntary.
Other than the time you spend on this project there are no known or foreseeable risks involved with this study.
You and/or society will or might indirectly benefit from understanding the sustainable technology adoption behavior of apparel professionals.
There is no compensation for participating.

We will do everything possible to make sure that your information is kept confidential. All information obtained in this study is strictly confidential unless disclosure is required by law. In the survey, we will not ask for any identifying information. The survey information will be stored separately (following UNCG ITS recommendation).

The data will be collected through the online software, Qualtrics. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

You do not have to be part of this project. This project is voluntary, and it is up to you to decide to participate in this research project. If you agree to participate at any time in this project, you may stop participating without penalty.

You can ask Md Arif Iqbal (m_iqbal3@uncg.edu) and Dr. Jin Su (j_su@uncg.edu) anything about the study. If you have concerns about how you have been treated in this study call the Office of Research Integrity Director at 1-855-251-2351.

Please click on the below link to the consent form. The survey link will be available at the end of the consent form.

https://uncg.qualtrics.com/jfe/form/SV_3lAJLEKzJAB5P4a

If you feel you are not the right person to answer the type of questions, please forward the survey to an appropriate person.

Survey Questionnaire

Screening Question

You have worked in the apparel industry in Bangladesh for at least 2 years.

- Yes
- No

Demographic Questions

1. Number of employees working in your firm now
    - Less than 1000
    - 1001 to 3000
    - 3001 to 5000
    - 5001 to 8000
    - More than 8000

2. The yearly turnover of your firm in 2021 (Million USD)
    - 10 to 50
    - 51 to 100
    - 101 to 150
    - More than 150

3. Type of apparel products your firm manufactures (select all that apply)
    - Knit garment
    - Woven garment
    - Sweater
    - Non-woven
    - Garment washing (Denim/Non-denim)
    - Others (Please specify _____________)

4. Your designation:
    - Executive
    - Assistant Manager
    - Deputy Manager
    - Manager
    - Senior Manager
    - Assistant General Manager
    - Deputy General Manager
    - General Manager
    - Assistant Director

- Director
- CEO
- Managing Director
- Others (Please specify ____________________)

5. Your typical responsibility at work
    - Merchandising
    - Production
    - Supply Chain
    - Administration
    - Commercial and other related operation
    - Others (Please specify ____________________)

6. Your experience in this company/firm (Years)
    - 2 to 5
    - 6 to 9
    - 10 or more

7. Your total experience in the apparel industry (Years)
    - 2 to 5
    - 6 to 9
    - 10 or more

8. Your gender
    - Male
    - Female
    - Non-binary/third gender
    - I prefer not to say

9. Your highest education level
    - Master's or above
    - Bachelor's
    - Do not have a bachelor's degree

10. If you have a bachelor's degree or above, answer the following.
    You have a Bachelor's/Master's degree in engineering/ technology/ science/ mathematics
    - Yes
    - No

Construct Related Questions

Sustainable Technology: Technologies such as computer-aided design, high-speed sewing machines, technology for dyeing and finishing apparel products with a reduced amount of energy, water, and chemicals, automation, information technology (IT) used in the sustainable production process, etc., can be termed as sustainable technologies which have been adopted in the apparel industry to improve the environment, the well-being of employees, and the economic performance of firms. In this section, your response will be collected through a five-point Likert scale (1=strongly disagree, 2=inclined to disagree, 3=neither agree nor disagree, 4=inclined to agree, 5=strongly agree).

Personal Involvement

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
11	I often get personally involved in matters related to the use of sustainable technology within the firm.	1	2	3	4	5
12	I would like to gather information about what newer sustainable technologies are introduced by our competitors.	1	2	3	4	5
13	I like to gather information about the current trend in the use of sustainable technologies in apparel firms.	1	2	3	4	5
14	As a manager, I am involved in making suggestions or decisions regarding sustainable technology within the firm.	1	2	3	4	5

Apparel Technology Knowledge

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
15	I know about modern apparel manufacturing technologies.	1	2	3	4	5
16	I am knowledgeable about the benefits of the use of modern technologies in apparel firms.	1	2	3	4	5
17	I believe I am informed about the technologies that are being used by my firm.	1	2	3	4	5

18	I frequently read news and articles to learn about the technologies used in the apparel industry.	1	2	3	4	5
19	I am knowledgeable about the impacts of technologies on apparel manufacturing.	1	2	3	4	5

Knowledge about Impact of Apparel Production on Environment

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				Strongly agree
20	I believe that I am informed about the environmental consequences of apparel production.	1	2	3	4	5
21	I am knowledgeable about the environmentally responsible apparel business.	1	2	3	4	5
22	I know the impact of chemicals used in apparel production on the environment.	1	2	3	4	5
23	In general, I believe I am sufficiently aware of the environmental issues caused by apparel manufacturing.	1	2	3	4	5
24	I believe I am sufficiently aware of the waste generated by apparel firms.	1	2	3	4	5
25	I frequently read news and articles to learn about the environmental issues of the apparel business.	1	2	3	4	5

Attention Check Question 1

	Strongly disagree				Strongly agree
Please choose "Disagree" for this item	1	2	3	4	5

Sustainable Technology Readiness

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				Strongly agree
	Optimism					

26	Sustainable technology gives people more control over their daily lives	1	2	3	4	5
27	Products and services that use the newest sustainable technologies are much more convenient to use.	1	2	3	4	5
28	I prefer to use the most advanced sustainable technology available.	1	2	3	4	5
29	Sustainable technology makes you more efficient in your occupation.	1	2	3	4	5
30	Learning about sustainable technology can be as rewarding as the technology itself.	1	2	3	4	5
31	Sustainable technology makes me more productive in my personal life.	1	2	3	4	5
	Innovativeness					
32	Other people come to me for advice on sustainable technologies.	1	2	3	4	5
33	In general, I am among the first in your circle of friends to acquire new sustainable technology when it appears.	1	2	3	4	5
34	I keep up with the latest and sustainable technological developments in my areas of interest.	1	2	3	4	5
35	I find I have fewer problems than other people in making sustainable technology work for me.	1	2	3	4	5
36	I can usually figure out new and sustainable high-tech products and services without help from others.	1	2	3	4	5
	Discomfort					
37	Sometimes, I think that sustainable technology systems are not designed for use by ordinary people.	1	2	3	4	5
38	There is no such thing as a manual for a sustainable high-tech machine that's written in plain language.	1	2	3	4	5
39	If I buy a high-tech sustainable product or service, I prefer to have the basic model over one with a lot of extra features.	1	2	3	4	5
40	New sustainable technology makes it too easy for governments and companies to spy on people.	1	2	3	4	5
41	Sustainable technology always seems to fail at the worst possible time.	1	2	3	4	5

42	When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do.	1	2	3	4	5
	Insecurity					
43	Whenever something gets automated, I need to check carefully that the system is not making mistakes.	1	2	3	4	5
44	People are too dependent on technology to do things for them.	1	2	3	4	5
45	Too much technology distracts people to a point that is harmful.	1	2	3	4	5
46	It can be risky to switch to a revolutionary new sustainable technology too quickly	1	2	3	4	5

<u>Relative Advantage of Sustainable Technology</u>

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
47	Sustainable technology will provide new opportunities in apparel manufacturing.	1	2	3	4	5
48	Sustainable technology will allow us to accomplish specific manufacturing tasks more quickly.	1	2	3	4	5
49	Sustainable technology will allow us to enhance our productivity.	1	2	3	4	5
50	Sustainable technology will allow us to save time in production.	1	2	3	4	5
51	Sustainable technology could reduce business operational costs by automating process.	1	2	3	4	5
52	Sustainable technology will provide new opportunities in waste minimization.	1	2	3	4	5
53	Sustainable technology will provide new opportunities in energy consumption.	1	2	3	4	5

<u>Attention Check Question 2</u>

		Strongly disagree				**Strongly agree**

Please choose "Agree" for this item	1	2	3	4	5

Facilitating Conditions

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
54	I have necessary resources to use sustainable technology.	1	2	3	4	5
55	I have the knowledge necessary to use sustainable technology.	1	2	3	4	5
56	I can get help from others when I have difficulties using sustainable technology.	1	2	3	4	5
57	Specialized instructions concerning use of sustainable technology are available to me.	1	2	3	4	5
58	Sustainable technology is compatible with other technologies I use.	1	2	3	4	5

Social Influences

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
59	People who are important to me think that I should use sustainable technology.	1	2	3	4	5
60	People who influence my behavior think that I should use sustainable technology.	1	2	3	4	5
61	People whose opinions that I value prefer that I use sustainable technology.	1	2	3	4	5
62	The senior management of my company is helpful in the use of sustainable technology.	1	2	3	4	5

Adoption Intention

Please indicate your level of agreement or disagreement with the following statements.

		Strongly disagree				**Strongly agree**
63	I intend to use sustainable technology in the future.	1	2	3	4	5

64	I predict I would use sustainable technology in the future.	1	2	3	4	5
65	I will always try to use sustainable technology in my daily life at work.	1	2	3	4	5
66	I plan to use sustainable technology frequently.	1	2	3	4	5
67	I will recommend others to use sustainable technology.	1	2	3	4	5

APPENDIX B: INSTITUTIONAL REVIEW BOARD APPROVAL

UNC GREENSBORO

March 24, 2023

Md Arif Iqbal
Jin Su

Consumer Apparel-Retail Stds

Re: Exempt - Initial - IRB-FY23-354 Sustainable Technology Readiness of Apparel Professionals in Bangladesh

Dear Dr. Md Arif Iqbal:

UNCG Institutional Review Board has rendered the decision below for Sustainable Technology Readiness of Apparel Professionals in Bangladesh.

Decision: Exempt

Approval: March 24, 2023
Expiration: June 1, 2023

Selected Categories: Exempt 2(i) and 2(ii)

This submission has been reviewed by the IRB and was determined to be exempt according to the regulatory category cited above under 45 CFR 46.104.

Investigator's Responsibilities

- ***IMPORTANT: If your study is funded***, your funds will not be released by the Contract & Grant Accounting (CGA) office until documentation of IRB approval is confirmed. Please link your Cayuse Human Ethics record to your Cayuse SP record so that the CGA office can confirm approval. Instructions for linking an application can be found on the Cayuse Human Ethics resource page. If your Ramses record has not been migrated to Cayuse SP, you may also forward this approval letter to the Contract & Grant Accounting Director, Bill Walters (wdwalter@uncg.edu).
- Please be aware that valid human subjects training and signed statements of confidentiality for all members of research team need to be kept on file with the lead investigator. Please note that you will also need to remain in compliance with the university "Access To and Retention of Research Data" Policy which can be found at http://policy.uncg.edu/university-policies/research_data/.
- **Please utilize the the consent form/information sheet with the most recent version date when enrolling participants.**

- Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented.
- **If your study is funded**, please note that it is the responsibility of the Principal Investigator to link your IRB application to your Cayuse SP record.

Sincerely,

UNCG Institutional Review Board