국제학석사학위논문

# Digital Transformation in Textile and Apparel Industry:

## Rules and Legal Framework in Digital Trade

섬유 · 의류 산업의 디지털 전환:

디지털 통상규범과 제도

2021 년 2 월

서울대학교 국제대학원

국제학과 국제통상전공

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# Digital Transformation in Textile and Apparel Industry:

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Yea Seul Chung

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## Rules and Legal Framework in Digital Trade

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February 2021

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# ABSTRACT


## Digital Transformation in Textile and Apparel Industry:
### Rules and Legal Framework in Digital Trade

Yea Seul Chung

Digital Transformation is imperative for any businesses today to remain active and connected in the evolving world. The digital surge has widely occurred in various areas, especially in troubled times of the pandemic, lockdown and social withdrawal. The digital transformation has been particularly recommended to textile and apparel industry by many experts in order to improve efficiency on every level in the business, and its necessity was emphasized even more with the recent severe downturn of the industry.

The prevailing attention to digital transformation is now apparent across all countries and businesses, yet its consequences have not been thoroughly perceived and prepared, causing serious issues and concerns. With the importance of digital transformation in the textile and apparel industry being highlighted, those problems are bound to serve as obstacles to the industry. Since digital trade happens in an intangible and transmissive form, its scope and pace of world trade are beyond control and expectation. Therefore, it is highly crucial to have an organized legal framework that prevents and regulates any potential troubles from transnational digital activities.

The international regulatory system on digital trade is currently in a state of confusion that requires cooperation and efforts. This paper examines the current status of

international digital trade regulations and accentuates the necessity to develop them from the status quo. Since the digital transformation will become more pervasive over time, countries will need to find a way to narrow down discrepancies in the understanding—collision between the idea of free data transfer and data sovereignty—to reach a consensus and build a robust international regulatory framework that encompasses every important aspect of digital trade.

Keywords: Digital Transformation, Textile and Apparel Industry, Digital Trade, Digital Trade Regulation, Digital Trade Agreement

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| **APEC** | Asia-Pacific Economic Cooperation |
| **CBPR** | Cross-Border Privacy Rules |
| **CPTPP** | Comprehensive and Progressive Agreement for Trans-Pacific Partnership |
| **DEPA** | Digital Economy Partnership Agreement |
| **DPD** | Data Protection Directive |
| **EU** | European Union |
| **FTA** | Free Trade Agreement |
| **GATS** | General Agreement on Trade in Services |
| **GDPR** | General Data Protection Regulation |
| **KSDPA** | Korea-Singapore Digital Partnership Agreement |
| **NAFTA** | North American Free Trade Agreement |
| **RCEP** | Regional Comprehensive Economic Partnership |
| **RTA** | Regional Trade Agreement |
| **SADEA** | Singapore-Australia Digital Economy Agreement |
| **TiSA** | Trade in Services Agreement |
| **USJDTA** | US-Japan Digital Trade Agreement |
| **USJTA** | US-Japan Trade Agreement |
| **USMCA** | US-Mexico-Canada Agreement |
| **WTO** | World Trade Organization |

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# I. Introduction

## 1. Background of Digital Transformation

With the arrival of the fourth industrial revolution, the scope of smart technologies like Artificial Intelligence (AI), robotics, cloud computing, the Internet of Things (IoT) and 3D printing has been expanded in diverse areas. Digital transformation is vital for all industries and businesses, whether small or large, to remain affiliated and competitive in the present society. Also, in the wake of the pandemic, the capability of adapting rapidly to unforeseen circumstances has become extremely crucial in order to manage supply chain disruptions, to handle time to market pressures and to meet constantly changing customer and societal expectations.

Even before the pandemic, digital transformation had been established as an imperative strategy to accelerate the success of business and to stay competitive in the game. Many traditional businesses have confronted difficulties or failed to survive in the changes of drastic digital innovation without any preparations. Even if they were able to remain in the industry, they had to continue to face the limitations that jeopardized their positions in the market. In fact, companies with advanced digital and analytical capabilities have begun to outperform competitors behind the curve and have become leading players of the industry.

The textile and apparel industry is one of the major sectors that has especially suffered from such circumstances. In order to understand these trends, it is critical to grasp

the concept, implementation and consequence of digital transformation relating to the particular industry. This paper discusses the importance of digital transformation in the textile and apparel industry and examines related issues and current international regulatory system on digital trade. Furthermore, it conveys the implications for the international level of digital trade regulations in Korea with regard to the advancement of its textile and apparel industry.

## 2. Scope of Digital Transformation

Digital transformation does not simply mean "going digital" from an outdated or analog system; it refers to the integration of digital technologies into all aspects of the business with strategies like digitization and digitalization but entails a higher notion of digital diffusion which constructs a brand-new business service, culture and experience for both societies and companies.

Digitization, digitalization and digital transformation differ on the role in a business and on the level of potential influence and value to a business. *Digitization* is the conversion from analog to digital, from paper-based to computer-based and from hand-written (or type-written) to analytically programmed. The digitization of data can be utilized in a variety of areas in a business, such as business and sales operations, supply chain management, product development, inventory control and customer relationship management. Companies can significantly reduce both costs and time to market, react faster to market trends and customer needs and work remotely with different teams and

across borders. Digitization is a pragmatic data governance which enables an efficient storage and management of big data through cloud computing or intranet within a corporate system. Unlike digitization, *digitalization* is a change at the process-level in business, leveraging information technology. *Digitization* is the conversion of data to a digital format whereas *digitalization* is the application of digital technologies for operational efficiency and productivity; for instance, a company can *digitize* documents to digital files and *digitalize* manufacturing factories or supply chain management to maximize efficiency.

*Digital transformation* goes beyond both concepts; digital transformation of business is not just a technical and operational development but also a cultural and organizational change. It merges a business process with digital technologies, structuring digital economy, and delivers value and messages to customers, improving the status quo to an advanced, effective and communicative environment. Digital transformation fundamentally anticipates systematical and financial benefits of business, but specifically, involves the entire process of value chain, end-to-end, from creation of a product to interaction with customers for pre- and post-sale customer experience strategy. It is a complete operational change, from a traditional process to an entirely new form, at the expense of corporate finance and own system; thus, long-standing companies are hesitant to consider digital transformation after all.

# II. Overview of Textile and Apparel Industry

## 1. Structure of Textile and Apparel Industry

### 1-1. *Types of Retailers*

Fashion brands are variably categorized by brand value, price range or reputation, but they can be simply segmented in three types in a broader sense: high-end fashion, contemporary designer and fast fashion brand. Each category differs in coping with digital transformation, depending on its brand philosophy, craftsmanship, production method, sales operations strategy and other management policies. For example, in 2018, *Chanel,* one of the well-known high-end brands, opened an online store in Korea but only with limited products of cosmetics due to its strict corporate policy. Also, in 2001, *Hermès* was the first luxury brand to launch e-commerce, especially in the US, yet reluctant to move further in online business and to entrust its online business to external companies. However, since online sales became the most important and promising power of growth in a consumer-facing industry, *Hermès* eventually launched its online sales website in China and Korea consecutively in 2018 and 2020 to drive better customer engagement. Even a 180-year-old brand, *Hermès*, has jumped into the online commerce market due to excessive demands for a sophisticated online experience, putting down its stubborn attitude towards digital strategy. Moreover, Phoebe Philo, a creative director of another high-end brand, *Céline*, once stated that "the chicest thing is when you don't exist in

Google," but *Céline* also, after all, launched a SNS account and an online store in 2017.[1] Taking account of the e-commerce boom for the past few decades, the high-end luxury fashion brands were far behind other clothing brands or brands from other industries. Furthermore, besides these digital strategies for sales and advertising, the digital transformation can be difficult to be adopted in the high-end fashion brands, especially for the process of creation and production, because their craftsmanship or particular method of design and construction is part of their brand identity, quality and strategy.

Fast fashion brands, on the other hand, require mass production, diverse designs and rapid responses to market trends; therefore, time to market is their competitiveness against other fashion sectors. Major fast fashion brands, such as *Zara* and *H&M*, operate their businesses based on speed and agility; once they figure out new trends to reflect on their products, they deploy their "hyper-rapid design and supply chain systems" to deliver a new collection to the market as soon as possible.[2] This digital transformation of business process can reduce time to market by 40 percent, along with a decrease in mistakes and defective products.[3] As a result, brands can save time and resources in the long run to reinvest into product quality or other operational needs.[4] Such advantages, in fact, allowed fast fashion brands to outpace traditional players in the market and Zara to reach the revenue at 1.8 billion US dollars in the first half of 2020 amid the industry slowdown.[5]

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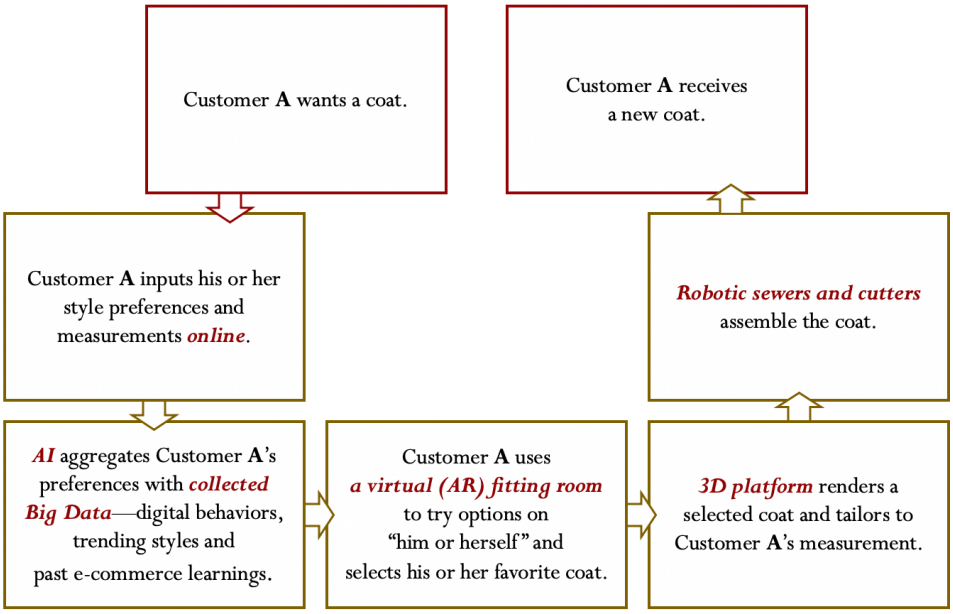
[1] Stuart Jeffries, "Internet Anonymity Is the Height of Chic," The Guardian (June 2013)
[2] "The Future of Fashion: Technology & the Industry," CB Insights Research (Oct. 2020)
[3] Volker Hämmerle, et al., "Why Fashion Must Go Digital-End to End," BCG (Jan. 2020), 2
[4] Ibid., 3
[5] "The Future of Fashion: Technology & the Industry," CB Insights Research (Oct. 2020)

## 1-2. *Business Process*

The process of fashion business varies by brand, brand type, and brand management system, yet it can be generally divided into the following stages: forecasting, budget planning, sourcing materials, sample making, pricing, production, quality control, marketing, sales, and inventory and customer management. Digital innovations can improve time to market or time to consumer along with each step of business process: AI computer science to forecast trends and customer needs, 3D platforms or 3D printing technology to design and render a product, supply chain automation to construct and manufacture a product in a much more timely manner, and so on *(Figure 1)*.

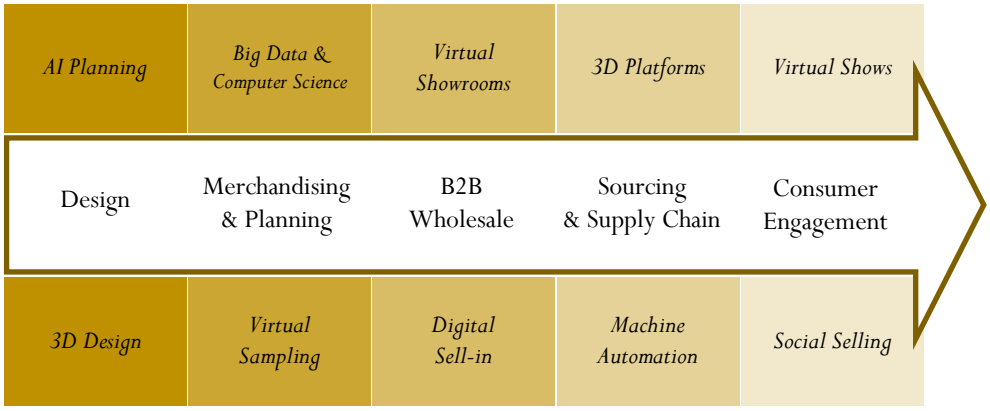
***Figure 1. The Impact of Digital Technologies on Fashion Business Process***




***Source:*** Adapted from CB insights, *The Future of Fashion: Technology & the Industry* (2020)

Such improvements will affect the whole paradigm of fashion-related businesses especially in GVCs (Global Value Chains) that no longer require conventional outsourcing or manufacturing strategies such as OEM (Original Equipment Manufacturing), ODM (Original Design Manufacturing) or offshoring. The digital transformation can apply extensively to the entire textile and apparel value chain, providing new operating and buying experiences to both companies and consumers *(Figure 2)*. For efficient digital transformations, it is encouraged for a company to anchor them strategically to its business model and operating process, with substantial changes between pre- and post-crisis approaches. In other words, a company needs to identify and prioritize digital technologies that benefit the most, then implement them to its new business strategies.

***Figure 2. Fashion Value Chain with Digital Innovations***




***Source:*** Adapted from McKinsey & Co., *The State of Fashion 2020 Coronavirus Update* (2020)

# 2. Current Status and Future Direction of Textile and Apparel Industry

## 2-1. *Industry Downturn*

The season transitioning from winter to spring is the time of year for consumers to search spring and summer collection for sunny weather and holiday travels. Instead, in March of 2020, the sales in clothing plummeted by 34 percent, due to global COVID-19 lockdowns.[6] However, even before then, the fashion industry was undergoing difficult times with major changes of the industry such as an increase of pre-owned, rental demands, a decrease of visits and sales for offline stores and a bipolarization of the industry and consumer demands into high-end and value market. Before 2020, fashion experts already expected the fashion industry to face the downturn in every segment in 2020 compared to the previous year.[7] Since the industry is particularly sensitive to market trends, related businesses have to be always ready to predict changes in consumer needs and value.

A few years ago, the fast fashion grew rapidly and enormously, but in 2019, it was forecasted as a cautious sector.[8] The reasons for its downturn can be variable, yet one of them is expected to be serious carbon emissions through frequent disposals of cheap, throwaway clothes, which result in the damaging effect of fast fashion against increasing environmental awareness. While some of the fast fashion brands experienced recessions,

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[6] Steven McIntosh, "Coronavirus: Why the Fashion Industry Faces an 'Existential Crisis,'" BBC (Apr. 2020)
[7] Imran Amed, et al., *The State of Fashion 2020*, McKinsey & Company (2019), 13–81
[8] Hämmerle, et al., 1

the luxury fashion brands were still expected to remain high in demand.[9] Interestingly, customers tend to focus their consumptions to invest on valuable, last-forever products as economy worsens, especially in Asia. Therefore, rapid adaptation and accommodation have now become indispensable for business operations as the perception and value of consumers are shifting depending on environments, technologies and social trends.

Despite the increasing sales of luxury brands in several regions, the fashion market in general was precariously close to recession due to the nature of the industry. The textile and apparel industry has been based on designs and crafts with a conventional manufacturing process since time immemorial. In addition, traditions like tailoring and fitting have made an offline store an essential retail channel to navigate and purchase clothes. Fashion businesses are still operated by a vast number of offline stores, even as the world has been transforming digital, time- and space-convenient with advanced technologies. Many offline stores have lost their footings recently; for instance, a sophisticated department store, *Barneys New York*, went bankrupt in 2019, finishing its long and renowned era. A trendy pioneer of fast fashion retailers, *Forever 21*, also filed for Chapter 11 bankruptcy protection in 2019, closing 178 of 800 stores including some in the US and most in Europe and Asia. Now that the offline channel is inclined to be considered as a showroom rather than a retail store, especially for *Gen Z* and *Phono Sapiens*, the importance of digital strategy has clearly come to the surface.[10] The

[9] Marco Beltrami, et al., *The State of Fashion 2019*, McKinsey & Company (2018), 11-21

[10] For information about the terms, *Gen Z* and *Phono Sapiens*, Business Insider defines that *Gen Z (Generation Z)* as "the generation that was born between 1996-2010, following millennials" and "has been raised on the internet and social media, with some the oldest finishing college by 2020 and entering the workforce." The Economist mentioned *Phono Sapiens,* a combination of *Phono (phone)* and *Sapiens (one who knows)*, to elaborate social trends that smartphones "have penetrated every aspect of daily life."

preconceived notions and the resistance to embrace digital culture due to the deep-rooted philosophy may have played a big part in some of the downfalls in the industry. After all, digital transformation appears to be inevitable for textile and apparel businesses to climb out of the mire.

## 2-2. *Impact of the COVID-19 Pandemic*

The COVID-19 has given rise to a threat around the world and a recessionary market economy that resembles nothing like the ones in the past decades, augmenting conflicts and instability. Due to both economic and humanitarian repercussions of the pandemic, the COVID-19 outbreak is deemed as "the worst crisis since World War II."[11] The pandemic has established another "*New Normal,*" changing the entire attitudes and circumstances of the society as consequences of lockdowns, social distancing and pervading mood of fear.

The fashion industry, one of the biggest industries in the world, generates 2.5 trillion US dollars in global annual revenues.[12] However, the capital of fashion and luxury retailers decreased by around 40 percent within the first 3 months of 2020. Also, the industry has been predicted to drop by 27 to 30 percent in global apparel and footwear sectors and by 35 to 39 percent in luxury sectors in 2020 while estimated to grow less than 5 percent in the following year.[13] The impact of the COVID-19 pandemic on fashion and

[11] "UN Chief Says Coronavirus Worst Global Crisis since World War II," France 24 (Apr. 2020)
[12] "The State of Fashion 2021: In Search of Promise in Perilous Times," McKinsey & Company (Dec. 2020)
[13] Amed, et al., 13-81

luxury sales were expected to lose between 450 and 600 billion US dollars, and it is a steeper drop than the one happened in the industry during the financial crisis in 2008. Such expected losses represent that this recession is more about existential anxiety than financial anxiety.[14] In other words, the feelings of unease and the deprivation of freedom in life due to the outbreak of fatal disease led to dire consequences for economy.

The fashion industry is one of the most negatively impacted industries by the COVID-19 outbreak on every level and the entire value chain of the industry has been considerably disrupted. The production has ceased, the demand has plummeted, and the retailers have either gone bankrupt or closed their stores *(Table 1)*. The economic recession in the industry has been mainly caused by three circumstances. First, a large number of store closures for the industry which greatly relies upon offline channels. Due to the characteristic of the industry, the fashion industry is almost entirely dependent on physical retail with more than 80% of transactions occurred in offline stores.[15] In fact, stores remaining closed for a few months have resulted in the financial difficulties of the majority of fashion companies in Europe and North America.[16] As shown in *Figure 3*, the closure of physical stores during lockdown would inflict serious damage to a business. The 3-month closure is expected to bring 84 percent of fashion businesses in the US, Canada and Europe into financial distress.[17]

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[14] Annachiara Biondi, "Fashion and Luxury Face $600 Billion Decline in Sales," Vogue Business (Mar. 2020)
[15] McIntosh, "More than 80% of transactions in the fashion industry still happen in physical stores."
[16] Amed, et al., 13-81
[17] Imran Amed, et al., *The State of Fashion 2020 Coronavirus Update*, McKinsey & Company (2020), 6–34

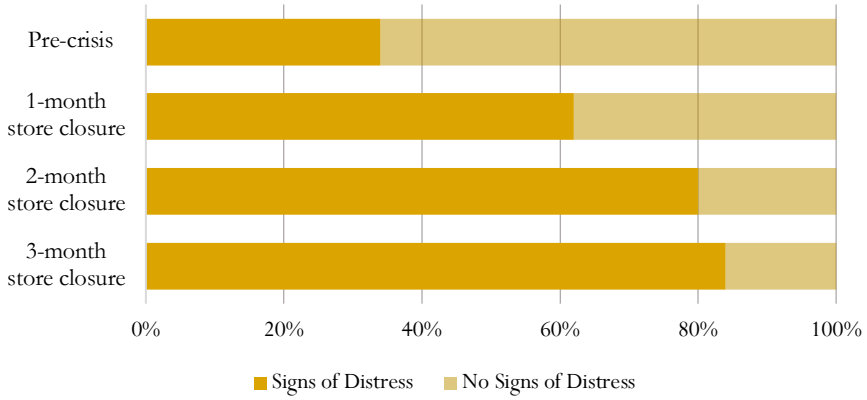
***Table 1. List of Significant Fashion and Fashion-Related Filings for Bankruptcy during the COVID-19 Outbreak (2020)***

| Date | Company Name | Country Filed | Type | Bankruptcy Status |
|---|---|---|---|---|
| Apr | *True Religion* | US | Denim Chain | (July 2017 – Round 1; Round 2) Chapter 11 bankruptcy |
| May | *J.Crew* | US | Premium Chain | Chapter 11 bankruptcy protection; (Sep 10) Emerged from bankruptcy |
| May | *J. Hilburn* | US | Custom Menswear | Chapter 11 bankruptcy |
| May | *John Varvatos* | US | Designer | Chapter 11 bankruptcy |
| May | *ALDO Group* | Canada, US | Footwear, Accessories | Protection |
| May | *Neiman Marcus Group* | US | Dept. Store | Chapter 11 bankruptcy |
| May | *J.C. Penney* | US | Dept. Store | Bankruptcy protection |
| May | *Lulu Guinness* | England | Accessories | Bankruptcy |
| May | *DVF Studio U.K.* | UK | High-end | Chapter 11 bankruptcy |
| July | *Lucky Brand Dungarees* | US | Denim Chain | Chapter 11 bankruptcy |
| July | *G Star Raw* | US | Chain | Bankruptcy |
| July | *Brooks Brothers* | US | Premium Chain | Bankruptcy |
| July | *RTW Retailwinds* | US | Retail Group | Chapter 11 bankruptcy |
| July | *Ascena Retail Group* | US | Retail Group | Chapter 11 bankruptcy |
| Aug | *Tailored Brands* | US | Menswear | Chapter 11 protection |
| Aug | *Lord & Taylor, Le Tote* | US | Dept. Store, Rental | Chapter 11 protection |
| Aug | *Stein Mart* | US | Off-price | Chapter 11 protection |
| Sep | *Century 21* | US | Dept. Store | Bankruptcy |
| Nov | *Furla USA* | US | Designer | Chapter 11 protection |

***Source:*** Adapted from The Fashion Law, *Retail Woes: A Running List of Fashion & Retail Bankruptcies*
***Note:***
Chapter 11 of the Bankruptcy Code "generally provides for reorganization, usually involving a corporation or partnership. A Chapter 11 debtor usually proposes a plan of reorganization to keep its business alive and pay creditors over time. People in business or individuals can also seek relief in Chapter 11." – See "Chapter 11 – Bankruptcy Basics," United States Courts, uscourts.gov

***Figure 3. Potential Impact of Lockdown Duration on Fashion Businesses***

*(% of Fashion Companies in the United States, Canada and Europe)*




***Source:*** McKinsey & Co., *The State of Fashion 2020 Coronavirus Update* (2020)

Second, a change of consumer attention from discretionary goods to necessary goods. Consumers are no longer interested in purchasing non-essential but desirable fashion items under the circumstances that restrict activities to shop out, eat out and travel around. During lockdown, the pandemic has induced consumers to instinctively prioritize daily use products over the rest.

Third, the malfunction of value chain due to humanitarian consequences.[18] The outbreak has already caused almost 1.9 million deaths and about 87 million infection cases around the world.[19] Since the industry is interconnected within the textile and apparel value chain, it has been hard hit by the disruption of supply chain and the hardship for employees, resulting in time to market delays. In addition, further consequential problems are not only the decrease in sales and corporate cash reserves but also the pile of

[18] Amed, et al., *The State of Fashion 2020 Coronavirus Update*, 6-34
[19] "Coronavirus disease," Google: Statistics, collected on 6 Jan 2021

inventories that will soon go out of style due to the trend-sensitiveness of the industry—unlike other daily use items. However, companies can take the situation as an opportunity to reassess and reconstruct the value chain of the industry. Effective recovery strategies must concern changes and shifts in trends relating to drawbacks of the industry that became exposed by the COVID-19 pandemic. For example, "self-islolation" behavior from the anxiety of going out caused more online shopping, more traffic to digital channels.[20]

During this *"untact"* era, the digital transformation is of the essence in strategy that cannot lag behind anymore.[21] Within a very short period of time, the global fashion industry became highly reliant on digital channels. If more consumers become comfortable with making purchases online or using digital platforms during the period of the pandemic, traditional offline retail channels will experience severe losses even after the lockdown is lifted. As a result, digital transformation will play a key role for the sustainability of business against all possible contingencies such as extended lockdowns and recurring economic contractions. Considering the period of *"New Normal"* as a foothold, the textile and apparel industry can turn *"New Normal"* into *"New Future"* that is brighter and more promising.[22]

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[20] Amed, et al., *The State of Fashion 2020 Coronavirus Update*, 6-34

[21] Julie Y. Lee, "The South Koreans Left behind in a Contact-Free Society," BBC (Aug. 2020)
For the term, *Untact*, Lee explains that *Untact* is "a combination of the prefix '*un'* and the word '*contact,'* that describes activities "without direct contact with others, such as using self-service kiosks, shopping online or making contactless payments."

[22] "From the 'New Normal' to a 'New Future': A Sustainable Response to COVID-19," World Health Organization (Oct. 2020)

# III. Digital Transformation in Textile and Apparel Industry

Consumers have visited online retailers for fashion purchases more than ever, and fashion businesses have embraced digital technologies faster than ever. The culture of *Phono Sapiens* has been expanded and intensified because the advantages of digital devices that are mobile, ubiquitous and transformative shined even more during the pandemic. The textile and apparel industry has gradually reflected these benefits in products, sales channels, platforms and technologies, and there are still more to come in the future with digital acceleration after these troubled times. In this chapter, four different categories of digital integration with fashion will be discussed with existing or potential issues and concerns.

## 1. E-Commerce and Digital Platforms

Fashion is the biggest market segment for B2C e-commerce. The global market size was estimated at around 525 billion US dollars in 2019 and expected to increase 8.6 percent per year, with a total market size of more than 1,000 billion US dollars by 2025.[23] Fashion e-commerce platforms today are beyond a traditional form; it provides not only an online commerce service but also other services through diverse digital platforms like

[23] Esther Shaulova and Lodovica Biagi, "Fashion ECommerce Report 2020," Statista (Nov. 2020)

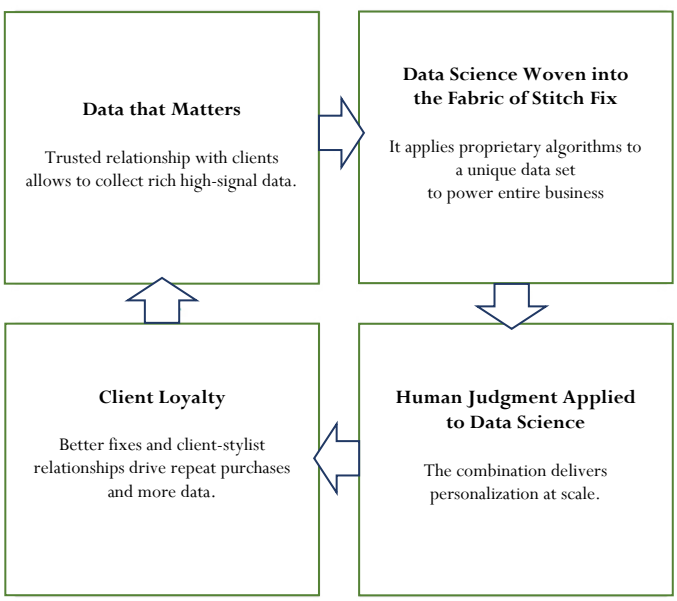
three-dimensional virtual fitting by augmented reality, crowdfunding for new designers and a monthly subscription box of personalized styling suggestions.

For example, *Stitch Fix*, an online personal styling service in the US, is operated through "unprecedented data science, not only in recommendation systems but also in human computation, resource management, inventory management, and algorithmic fashion design and many other areas," under a motto of "transforming the way people find what they love."[24] As illustrated in *Figure 4*, the machine learning and AI algorithm take up a big part in its business model: *algorithms* to calculate a cost function and to assign the warehouse based on the location and inventory status and *intelligent machines* to evaluate a customer's likelihood and to rank the inventories based on match scores.[25] The personalized recommendation for outfits is processed by a combination of these algorithms and human stylists; it is first sorted out through the algorithm based on personal information and a questionnaire on style preference, called *Style Quiz*, then decided by human stylists to optimize the match. A personalized box of selected items is sent to customers, and once received by the customers, they decide to keep the ones they like and return the rest. *Stitch Fix* is constantly building data for each customer over time, and this acts as a data lock-in element, which can be beneficial for both company and repeat customers to provide and receive more accurate styling service. By leveraging digital technologies into common fashion e-commerce services, the business could spend less budgets on employees, products or product-marketing and more time to help or interact

[24] "Stitch Fix Algorithms Tour," Stitch Fix
[25] "Stitch Fix Algorithms Tour," Stitch Fix

with customers. This service fundamentally changed purchase experiences for fashion consumers and a traditional retail e-commerce paradigm with a concept of "personalized" box; it penetrated social trends and consumer needs toward personal, custom-fit or bespoke things.

***Figure 4. Stitch Fix's Business Model***

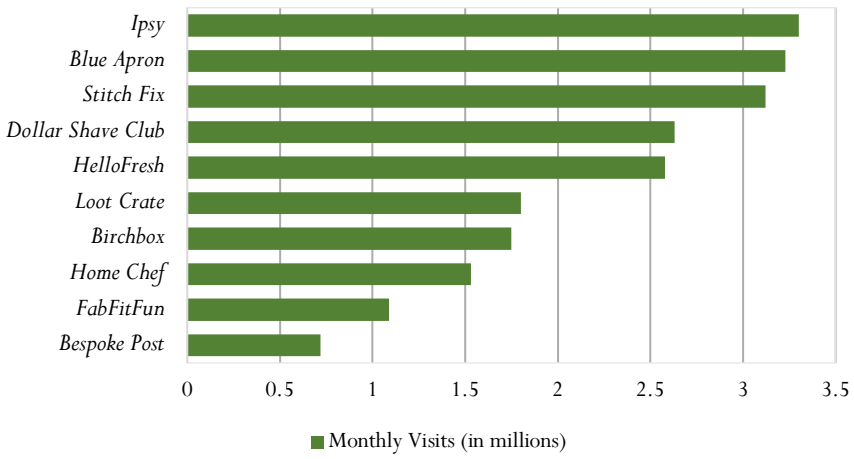



***Source:*** Stitch Fix

However, as more e-commerce services or digital platforms leverage digital technologies associated with data of personal information, the collected data should be carefully managed and protected, preventing any sorts of data leakage issues. The AI-driven fashion businesses, like *Stitch Fix,* which owns a significant amount of personal data including gender, age, size, pregnancy status, style preference, payment information

from regular automatic deliveries, and more, can be subject to serious data leakage from external hacking, related third-party businesses or others. In fact, *Stitch Fix* encountered several issues with "stolen credit card numbers and other forms of fraud" a few years ago.[26] Since *Stitch Fix* has been the most popular personalized box for clothing used by many customers for the past few years, it must pay extra attention to the issues concerning data, privacy and personal information (*Figure 5*).

***Figure 5. Most Popular Online Subscription Box Retailers in the US***
*(by visits, as of September 2017)*




***Source:*** Statista in B2C E-Commerce[27]
***Note:*** Ipsy (Cosmetics), Blue Apron (Meal-kit Service), Stitch Fix (Clothing), Dollar Shave Club (Men's Grooming Products), HelloFresh (Meal-kit Service), Loot Crate (Gaming-related Merchandises), Birchbox (Beauty-related Products), Home Chef (Food and Meal-kit Service), FabFitFun (Beauty, Fashion, Fitness, Lifestyle Products), Bespoke Post (Men's Products)

[26] Tonya Garcia, "Stitch Fix IPO: 5 Things to Know about Online Clothing Service," MarketWatch (Nov. 2017)
[27] Tugba Sabanoglu, "U.S. Online Subscription Box Brands by Visits 2017," Statista (Dec. 2020)

Moreover, there is another personal styling service, called *Trunk Club*, which is a pioneer of this try-on-at-home service within men's fashion industry—now for both men's and women's. *Trunk Club* is affiliated with a huge retail enterprise, *Nordstrom*. In 2018, *Nordstrom* had a problem in regard to data leakage, exposing data of personal and financial details of its employees.[28] The data leakage or data breach with privacy violation can commonly occur in the digital world that is in need of protection to prevent or deal with serious problems.

## 2. Digital Wearable Devices and Mobile App Services

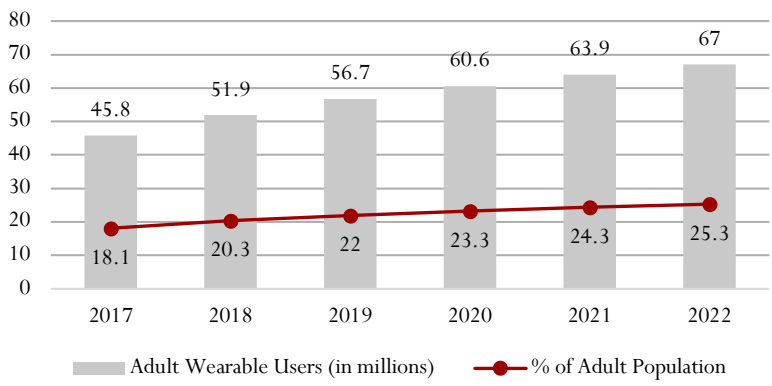
Passed through the era of *portable*, the world has entered into the era of *wearable*. People now prefer to wear or attach digital technologies on their bodies in order to take them wherever they go and use them whenever they need. Therefore, the integrated gadget of fashion and digital technologies have continued to evolve in various forms. The most popular digital wearable at the moment, *Apple Watch*, is a fashion device with its interchangeable bands such as NATO band, Milanese loop and *Hermès* leather strap.

The digital wearable, or "a wearable computer," is a smart device that connects to the internet and other digital functions, and often regarded as a replacement of smartphones. The first Bluetooth headset and the portable action camera, *GoPro*, were both introduced as digital wearable devices in the beginning of the 2000s, and *Google Glass*, the first voice-

[28] Jeremy Kirk, "Nordstrom Blames Breach of Employee Data on Contractor," Bank Information Security (Nov. 2018)

operated optical head-mounted display (OHMD) product, was released in 2013. The scope of digital wearable development has expanded to a variety of areas over time and the forms also have been diversified with advanced technologies. Moreover, the market for digital wearables has continuously increased in size; one-fifth of the US adult population used a wearable device at least once a month in 2018 *(Figure 6)*.[29] Within this population, the largest group of the wearable users, ages 25 to 34, was expected to increase by almost 60 percent in 4 years, and those ages 55 to 64 by more than 100 percent despite low user penetration at 6.5 percent in 2015 *(Figure 7)*.[30]

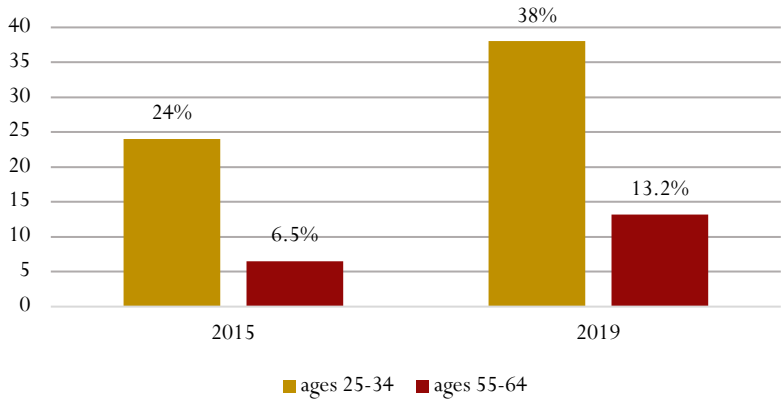
***Figure 6. Adult Wearable Users in the US***
*(in millions and % of adult population (ages 18+), 2017-2022)*




***Source:*** Insider Intelligence, *Wearables 2019*
***Note:*** Users in this context defines as *adults who use a digital wearable at least once per month.*

[29] Yoram Wurmser, "Wearables 2019," Insider Intelligence (Jan. 2019)
[30] Ibid.

***Figure 7. US Adult Wearable Users and Penetration, by Age***
*(% of each population by ages (ages 25-34 and 55-64), 2015 and 2019)*




***Source:*** Adapted from Insider Intelligence, *Wearables 2019*

The most successful digital wearables are currently smartwatches *(Table 2)*.[31] The sales of smartwatches from 2014 to 2018 was 52 percent of the global wearable market and it was forecasted to increase further to over 100 million units in several years.[32] The top smartwatch brands in the world are *Apple, Fitbit, Samsung* and *Garmin (Table 3)*. *Apple* has dominated the market since the launch of *Apple Watch* in 2015 and *Samsung* has continued to grow with its advanced features as an Android watch. *Fitbit* has been popular for its fitness and health tracking function and *Garmin* for sports and GPS tracking and heart rate monitor. However, upon *Google*'s acquisition of *Fitbit*, the fear of cybercrimes has been elevated. *Fitbit* has already experienced cyberattacks on its users' accounts in the end of 2015.[33] The terrifying part of the incident was that the hackers might

[31] Arne Holst, "Wearable Technology - Statistics & Facts," Statista (Mar. 2020)
[32] "Global Smartwatch Unit Sales Forecast 2018-2023," Statista (Jan. 2021)
[33] Dan Mangan, "There's a Hack for That: Fitbit User Accounts Attacked," CNBC (Jan. 2016)

have gained the users' identifiable information such as GPS history and jogging or sleep patterns to track down and follow them which could lead into another serious crimes. Also, *Garmin* recently went through a ransomware attack that might have caused the breach of customer data and payment information.[34] This attack took down its apps, customer service infrastructure and other services, showing that the companies like *Garmin* with highly sensitive data are major targets for cyberattacks. Despite the size and popularity, *Garmin* was not prepared for the cyberattack that costed millions of US dollars to restore the system. The businesses that collect a great volume of personal data can expect the similar cybercrime anytime again; thus, it is critical to prepare protection measures concerning cybersecurity and privacy protection in order to prevent issues from repeating in the future.

***Table 2. Forecast for Shipments of Wearable Digital Technology Worldwide***
*(in millions of units, by types, 2017-2022)*

| | 2017 | 2018 | 2019 | 2022 |
|---|---|---|---|---|
| Smartwatch | 41.5 | 53.0 | 74.1 | 115.2 |
| Wristband | 36.0 | 39.0 | 41.9 | 51.7 |
| Ear-worn | 21.5 | 33.4 | 46.1 | 158.4 |
| Head-mounted Display | 19.1 | 28.4 | 34.8 | 80.2 |
| Sports Watch | 18.6 | 19.5 | 21.3 | 27.7 |
| Smart Clothing | 4.1 | 5.7 | 6.9 | 19.9 |
| **Total** | **140.8** | **178.9** | **225.1** | **453.2** |

***Source:*** Gartner, Inc. (2018)
***Note:*** Numbers have been rounded to the nearest tenth. Data includes forecasts in number based on the industry trend.

[34] Joe Tidy, "Garmin Begins Recovery from Ransomware Attack," BBC (July 2020)

***Table 3. Global Smartwatch Vendor Shipments and Market Share in Q4 2018***

| | | Q4 2017 | 2017 | Q4 2018 | 2018 |
|---|---|---|---|---|---|
| Global Smartwatch Vendor Shipments *(millions of units)* | Apple | 7.8 | 17.7 | 9.2 | 22.5 |
| | Fitbit | 0.5 | 0.5 | 2.3 | 5.5 |
| | Samsung | 0.6 | 3.1 | 2.4 | 5.3 |
| | Garmin | 0.7 | 2.2 | 1.1 | 3.2 |
| | Others | 2.0 | 5.8 | 3.2 | 8.5 |
| | **Total** | **11.6** | **29.3** | **18.2** | **45.0** |
| Global Smartwatch Vendor Marketshare *(% of Total)* | Apple | 67.2 | 60.4 | 50.7 | 50.0 |
| | Fitbit | 4.3 | 1.7 | 12.7 | 12.2 |
| | Samsung | 5.2 | 10.6 | 13.2 | 11.8 |
| | Garmin | 6.0 | 7.5 | 6.1 | 7.1 |
| | Others | 17.2 | 19.8 | 17.4 | 18.9 |
| | **Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| Total Growth YoY | | 41% | 39% | 56% | 54% |

***Source:*** Strategy Analytics (2019)

# 3. Smart Textiles and Smart Garments

Smart textiles are intelligent materials made with sensors, processors, devices and nanotechnologies for various uses. They include not only technical functions, such as Bluetooth and NFC technology, but also other convenient features, such as protection from external factors, automatic temperature adjustment and certain health detection. The functionalities of these smart textiles serve the following purposes: to inform, to protect and to relax. In the late 1990s, the concept of "e-textile" was first introduced with the features of "detection, processing and updating," in new materials like plastics, metals and

more.[35] The smart textiles have been developed over time and used in diverse forms and areas such as military equipment, protection equipment, sports equipment, leisure and entertainment.[36]

Smart garments can be categorized into two types in terms of technology facilitation: fiber-level technology and digital convergence. The products with fiber-level technology are made of materials in nanofibers or with (nano)sensors that enable special functionalities.[37] The functionalities of these smart garments include water and heat resistance, cardiovascular monitoring, body temperature detection, thermal management or heat transmission. It is widely used and developed by sports and outdoor companies that produce high performance products. For instance, an outdoor clothing brand, *Kolon Sport* integrated a smart fabric, *HeaTex*, with their *Life Tech Jacket*. *HeaTex* is a self-heating fabric, based on electronic circuitry and conductive polymer printing technology, which enhances mobility and cold-proof feature for outdoor activities.

The products with digital convergence are usually in forms of regular clothes or other fashion items with integration of digital technology, rather than creation of an entirely new form. *Kolon Sport*'s *Life Tech Jacket* also has a digital technology fusion technique that connects its smart garment to electronic devices. For example, the jacket has a built-in outdoor "black box" for GPS, photo and video recording and wind turbine generator for power generating function to charge a phone or other electronic devices. In

[35] Elena Rotari and Corina Negara, "Possibilities and Applications of Smart Textiles," MATEC Web of Conferences 112 (2017), 1-6
[36] Ibid.
[37] Prashanth Shyamkumar, et al., "Wearable Wireless Cardiovascular Monitoring Using Textile-Based Nanosensor and Nanomaterial Systems," Electronics 3 (2014), 504–520

addition, smart sneakers, such as *Nike Adapt,* have features in self-tying and smart locks by custom motor and gear train senses and connected mobile app to find the data such as location, steps and running pace that the sneakers collect while people moving in them.[38] Also, *Rogatis* from *Samsung C&T Fashion Group* introduced a smart suit with a NFC chip embedded inside the pocket or its sleeve button that activates several features of smartphone; tagging the phone to the NFC chip can unlock a phone, switch to silent mode, block incoming calls, turn on the music and send business cards by SMS and email.[39]

Smart textiles and garments will continue to be introduced in more advanced forms as the research and development are still in progress in various fields of tech, science, healthcare and fashion. One of the most studied areas of smart textiles has been a "wearable biomedical monitoring system for cardiovascular health," in use of "nanomaterials and nanostructures in textiles."[40] Before they become commercialized and accessible, the potential consequences need to be thoroughly examined to prevent breaches of sensitive data in advance.

## 4. Virtual Fitting and 3D Technologies

Virtual Reality (VR) and Augmented Reality (AR) technology drive sales and more customers in fashion and cosmetics, especially during the pandemic that has been

[38] "New Smart Shoes from Nike," IDTechEx (Jan. 2019)
[39] See Jee-yeon Seo, "High-End Suit Brand Offers Smart Solutions," The Korea Herald (Sep. 2014) and "Smart Series Part 3: When Fashion and IT Collide - Wearables Take the Next Step," Samsung C&T Newsroom (Aug. 2016) for more details.
[40] Shyamkumar, et al. 2014

reshaping the role of stores and consumer behaviors. The lockdown has limited the stores to operate as they did in the past; samples were put away, fitting rooms were taped off and human interactions were restricted. Virtual and augmented reality technology have been applied to many areas—phones, games and more—even before the pandemic, and it has also been applied to fashion businesses on a trial basis to introduce and demonstrate to the public. The virtual fitting room or showroom on digital platforms, apps or devices inside the store is a groundbreaking idea for the fashion industry where try-on and personal fitting are extremely important to generate sales. The fitting room and showroom become omnipresent just with an access on their smartphones, and this new form of fitting room provides playful and productive shopping experiences to customers. *Zeekit*, a major vendor of AR technology to fashion brands, has planned to launch the world's largest virtual fitting room filled with fashion items that customers can drag onto the photos of themselves.[41] However, this service has implicit risks of serious privacy issues; an online try-on through webcam or selfies can expose biometric information which is extremely private.

Other promising yet worrisome technologies in the fashion industry are three-dimensional printing and three-dimensional body scanning tailoring. They have major advantages in design and production with custom-fit clothing—more precise than human tailoring—through accurate measurement and structure. However, these advanced technologies can be extremely controversial in regard to privacy protection because they

[41] Abha Bhattarai, "Virtual Try-Ons Are Replacing Fitting Rooms during the Pandemic," The Washington Post (July 2020)

automatically collect highly sensitive biometric data with detailed measurements of an entire body that is directly linked to personally identifiable information (PII).[42]

As the textile and apparel industry advances through digital transformation, the businesses will be exposed to more risks and threats such as cybercrimes, fraud, data breach and data leakage. Since the industry does not seem to revert to the traditional system, it will continue to advance further with digital technologies and encounter circumstances where its businesses and consumer privacy are violated. The fashion brands have also been developing blockchain technology—that has "transformative potential" in almost every industry—in the supply chain system for the last few years. *Provenace*, a blockchain startup, ran a pilot test operation of fashion blockchain project in 2017.[43] It can track every step from raw materials to finished clothes—from an alpaca farm to a mill to a designer. Consumers can see the current status of their product within the entire process—manufacturing to distribution—just by scanning its label. Furthermore, in 2019, *Nike* patented for their sneakers, "*CryptoKicks*," that can be tracked and authenticated through the blockchain-based system. The digital assets come along with these shoes to its owner, or "unique identifier," and the ownership is transferred upon the sale of the shoes and associated digital assets. Then, these digital assets will be stored in the app of

[42] US Office of Privacy and Open Government defines *personally identifiable information* (PII) as "information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. […]"
[43] "The Future of Fashion: Technology & the Industry," CB Insights

cryptocurrency wallet.[44] *CryptoKicks* have not launched yet, but it is expected at some point in the future. It is highly significant to acknowledge that these digital engagements may entail subsequent issues and that further developments need to be protected under a proper legal framework. In the next two chapters, the current rules and legal frameworks that can be possibly applied to the issues addressed in this chapter will be discussed.

[44] Matthew Beedham, "Nike Now Holds Patent for Blockchain-Based Sneakers Called 'CryptoKicks,'" Hard Fork The Next Web (Dec. 2019)

# IV. Digital Trade Regulations at the Multilateral Level

The greater the range of digital transformation becomes, the more responsible the country or the company needs to be for its issues and consequences. The digital transformation has progressed rapidly in many fields and also accelerated upon the outbreak of COVID-19. The textile and apparel industry has an extensive and substantial engagement with digital technologies, and the industry anticipates further applicability of digital transformation to diverse areas, in diverse forms. However, digital products have different characteristics from traditional goods and services, resulting in problems that cannot be addressed by conventional trade rules.[45] Moreover, they have an incorporeal nature so that the importance of constructing a regulatory framework has been easily overlooked. Furthermore, digital escalation permeates the world much faster in speed than a proper international regime is prepared. Therefore, it is undoubtedly necessary to establish strict digital-related policies—at all multilateral, regional and national levels—which in turn prevent and regulate pervasive global digital issues regarding privacy violation, data breach or leakage, cyberattacks, online fraud and intellectual property infringement.

Data transfers and wearable technologies are all included in the boundary of the so-called digital trade. The digital trade has not been specifically defined but generally

[45] See page 41 for the definition of "digital product" stated in the digital chapter of RTAs.

understood as "digitally enabled transactions in trade in goods and services which can be either digitally or physically delivered and which involve consumers, firms and governments."[46] Moreover, it encompasses "business-to-business transactions, including within GVCs, as well as transactions between consumers or businesses through online platforms," and all transactions were based on "data," which is key value for digital trade.[47] As the proliferation of digital trade has been demanding compatible rules of world's trade, it is necessary to understand the current regulatory system and the international effort toward digital trade agreement.

The current regulatory principles on digital trade can be divided into three categories: regulations set by global multilateral fora, rules on regional trade agreements and national law. Unlike the national law, the multilateral organizations and the regional trade agreements "co-ruminate" or seek mutual benefits between countries in the scope of digital trade at the international level. The digital trade regulations of multilateral organizations are applicable in a comprehensive extent such as WTO, EU, APEC and more. They promote common interests in digital trade through international regulatory regimes or guidelines to control and supervise possible issues relating to the sector that is still new and evolving.

The digital trade regulations in the regional trade agreements are binding to the countries in the group with specific rules of conduct, with further influence on the international regimes of digital trade. The major purposes of these bilateral or plurilateral

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[46] Yasmin Ismail, *International Institute for Sustainable Development*, E-Commerce in the World Trade Organization: History and Latest Developments in the Negotiations under the Joint Statement (2020), 3. López González & Jouanjean developed definitions of digital trade. (2017)
[47] Ibid. (OECD, 2019b, 1)

agreements on digital trade (or e-commerce) are to encourage the free flow of data across borders and to enable innovative and interconnected businesses between countries under safer and more efficient circumstances. These digital trade agreements have sprung up in the past decade from CPTPP to ongoing KSDPA negotiation, but still need further work to be solid, specific and widely effective in consideration of various digital-related issues that are occurring at this very moment.

## 1. Digital Trade Regulations in the WTO

The digital trade started to make progress in the 1990s when the member countries of WTO negotiated to break down the trade barriers such as customs duties on electronic transmission. The global e-commerce was first recognized at the Second Ministerial Conference in 1998, where the ministers adopted the *Declaration on Global Electronic Commerce* for "growing and creating more opportunities for trade."[48] It led to the establishment of the *WTO Work Programme on E-Commerce*, which was later adopted by the General Council in the same year, to "examine all trade-related issues relating to global e-commerce."[49] This program has been implemented by the relevant bodies of WTO—the Council on Trade in Goods, the Council on Trade in Services, the Trade-Related Intellectual Property Commission and the Trade Development Commission—and regularly reviewed by the General Council.[50] They are responsible to oversee trade issues

[48] "Electronic Commerce," World Trade Organization
[49] Ibid.
[50] Ibid.

of global e-commerce at a multilateral level and to explore the association between e-commerce and its trade-related aspects within the existing WTO trade agreements. The e-commerce is defined in a broad range as "the production, distribution, marketing, sale or delivery of goods and services by electronic means," which is a narrower perspective than the present term of digital trade that covers other digital-related activities like intellectual property.[51]

Despite the initiative, there has been no significant progress with the program or with any further agreements in the WTO, other than moratorium on customs duties on electronic transmissions. However, the moratorium is designed to be temporary—extended biennially—so there may be a possibility to lapse at some point.[52] It rather seems more plausible to achieve the digital trade agreement in the scope of GATS specific commitments or TiSA negotiations, under the premise that members can reach a consensus without controversies. The failure to take the issues further demonstrates that the digital trade issues have limited support or agreement for the members of WTO. Rather, the regulatory principles from other international fora or RTAs (or FTAs) are more active and practical, indicating the difficulties of the WTO negotiations on digital trade. In addition, many WTO member countries lack the capacity of advanced technologies to make the full use of digital trade agreement. In spite of the diffusion of digital technologies, the digital trade agreement is still considered more importantly in the countries like US, Canada, Korea or Japan. Moreover, countries have different views and approaches toward digital

[51] Ismail 2020, 2
[52] "WTO Moratorium on Customs Duties on Electronic Transmissions: A Primer for Business," ICC International Chamber of Commerce (2019)

trade regulations; some have asserted the excessive regulation of digital trade as a trade barrier whereas others have emphasized the importance of data protection and individual safety through a strict regulatory system. There are also countries that have had little perceptions of digital trade. Therefore, bilateral or plurilateral agreements have been expected to be more pragmatic and efficient to discuss digital trade regulations. In fact, approximately more than 60 FTAs incorporated provisions on digital trade, including e-commerce, by the late 2017.[53] The extent to cover digital trade is highly variable depending on the FTA, but the scope has been expanding in order to encompass a broader range of digital trade issues as the significance of digital trade continues to rise day by day.

## 2. EU General Data Protection Regulation (GDPR)

European Union enacted the *Data Protection Directive* (DPD), officially known as *Directive 95/46/EC*, in 1995 to protect an individual's personal data within the EU and to regulate the free movement of such data.[54] The directive involved seven non-binding principles (notice; purpose; consent; security; disclosure; access; accountability), emphasizing privacy and human rights. The General Data Protection Regulation (GDPR) was adopted later in 2012 and has been the core digital privacy legislation in Europe since then. The GDPR has replaced previous data protection rules across Europe as the new

[53] Y. Abe and D. Collins, "The CPTPP and Digital Trade: Embracing E-Commerce Opportunities for SMEs in Japan and Canada," Transnational Dispute Management (2018)
[54] "DIRECTIVE 95/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL." Official Journal of the European Communities (Oct. 1995)

data-heavy lifestyles of the society generated free online transfer of or access to personal information which were left exposed and vulnerable to cybercrimes. In fact, average costs of cybercrimes in Europe have been increasing exponentially every year, reaching about 50,000 euros in 2020.[55] Compared to the DPD, the GDPR is a unified EU-wide law that enables more transparent and effective regulatory environment, applying to an extensive range—both EU and non-EU businesses—in order to ensure broader protection and rights to individuals. In addition, it aims to facilitate cross-border cooperation between the EU countries in case of the disputes or conflicts on cybercrimes and cyberterrorism.[56]

The principles of GDPR seem similar to those of DPD, but they are more defined and expansive in terms of protection coverage. For instance, the DPD defines personal data as "any information relating to an identified or identifiable natural person […] directly or indirectly […] factors specific to his physical, physiological, mental, economic, cultural or social identity," such as names, photos, email addresses, personal identification numbers and credit card information.[57] On the other hand, the GDPR goes further redefining personal data as information that can be used in conjunction with other data to identify an individual, including biometric data such as fingerprints, retina scans, medical information, geolocation, computer IP addresses and mobile device identifiers. The GDPR's scope of personal data makes much more sense to apply to new forms of digital trade such as wearable devices and digital platforms that require highly private data

[55] Ibid.
[56] *Proposal for a Regulation of the European Parliament and of the Council on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data (General Data Protection Regulation) - Preparation of a general approach*, Council of the European Union (2015)
[57] "DIRECTIVE 95/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL." Official Journal of the European Communities (Oct. 1995)

collection. Moreover, the GDPR ensures individual rights to access and delete their personal data. Data controllers, or data collectors, must exactly state where, how and for what purposes the personal data will be used to each individual. If an individual wishes to delete and cease further usage, he or she has the right to be deleted from the data controllers. Furthermore, a main difference and implication the GDPR has on business is that both data controllers and data processors are under GDPR compliances; when data processors or third parties wish to work with personal data from EU residents, they are required to have a contract with data controllers to outsource such data, thereby putting both data processors and controllers responsible under GDPR compliance. If there is any mishandling, misuse or malicious exploitation of personal data, both data processors and controllers will hold accountable and liable for violations while the DPD only holds data controllers responsible. As stated above, the GDPR regulations apply to a broader range, any organizations and companies that provide goods or services to consumers and businesses of the EU, indicating that the businesses located outside of the EU must comply with the GDPR regulations as well. This means that almost every global business needs to achieve GDPR compliance, making the GDPR a worldwide regulatory system.

This framework has provided individuals far more control over their personal information data, and enforced data controllers and non-EU data processors to work under stricter regulations. For the fashion industry, which have been going through digital transformation of its own, the GDPR compliance is especially critical not only because the European textile and apparel market plays a pivotal role in this specific industry but also because the industry is heavily dependent on personal data, including biometric

information such as body measurements and other identifiable information. Now that the GDPR became widely influential, global fashion companies and non-EU countries must come up with the GDPR compliance strategies that facilitate digital trade at the international level.

## 3. APEC Cross-border Private Rules (CBPR) and the Privacy Framework

### *Background of the CBPR System*

The APEC Cross-border Private Rules (CBPR) system is a developed mechanism built upon the APEC Privacy Framework, which is a set of principles and guidelines of implementation borrowed from *the OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data*.[58] The APEC Privacy Framework was endorsed in 2004 and updated in 2015 in order to protect privacy within the free flow of information. The main purpose of the framework is to have the member countries benefit from effective privacy protections without barriers to information flows, thereby promoting trade and economic growth.[59] There are four purposes of the framework: i) structuring effective privacy protections from intrusions and misuses; ii) imposing uniform approaches in the use of data and personal information; iii) authorizing enforcement agencies to protect

[58] "Benefits of the APEC Cross-Border Privacy Rules," The APEC CBPRs: Protecting Information, Driving Growth, Enabling Innovation, C&M International (Jan. 2019)
[59] *APEC Privacy Framework (2015),* CTI Sub-Fora & Industry Dialogues Groups and Digital Economy Steering Group, (2017), 2

privacy; and iv) developing mechanisms to enforce adequate information privacy protections and to enable secure information flows among member countries. Its purposes and implementation guidelines underlay the APEC Privacy Pathfinder, a project to build a clear system for organizations to use as standards.

The CBPR system, created in 2011 by APEC member economies, was based on the purposes and the criteria of the Pathfinder and the goal of both APEC and the Privacy Framework. It was developed to reinforce a regional mechanism of the APEC Privacy Framework with a practical and systematic process.

### *How the CBPR System Works*

Under the CBPR system, privacy policies and practices consistent with the CBPR program requirements should be implemented for all personal information that has passed across the borders. The CBPR system reflects the non-binding principles of the Privacy Framework, thus the system operates in a voluntary structure based on the accountability of each country on compliance.

There are important steps to follow to participate in the CBPR system: self-assessment, compliance review, recognition and acceptance, and dispute resolution and enforcement. Each country should have a governmental enforcement agency and at least one APEC-approved third-party accountability agency—such as *TrustArc* for the United States and *Korea Internet & Security Agency (KISA)* for Korea—to assess its practices and to review its compliance. In order to secure the CBPR compliance, the accountability agent needs to prove that the information privacy policies of an organization are compliant with

the CBPR system. The CBPR system offers a minimum level of protection standards where an organization has a lack of or no applicable domestic regulations on privacy protection.[60] Since the CBPR system does not replace domestic laws and regulations, a CBPR-certified organization needs to comply with both standards that may put an organization in a more difficult situation. However, the countries without any valid domestic laws can benefit from data and privacy protections under the CBPR system if the data-owned organization is compliant to the CBPR requirement. In the same context, USMCA states in the Article 19.8 of the digital trade chapter that the APEC Privacy Framework and the CBPR system are valid mechanisms for those in need of adopting a legal framework or promoting compatibility between different regimes.[61]

### *Benefits of the CBPR System*

As the information data flows across the border become more vital in a business, a business-driven approach to data privacy protection is critical in order to have solid internal rules and corporate procedures under an objective oversight of the external management. The CBPR system provides flexible standards according to the operational differences and needs of each organization to avoid inefficient and unnecessarily strict burdens on data regulations. The CBPR certification of a business ensures safety and trust with its commitment to consumer privacy, offers a guidance of privacy protection regulations and alleviates trade frictions in a global market.

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[60] *APEC Cross-Border Privacy Rules System: Policies, Rules and Guidelines*, 10
[61] *United States–Mexico–Canada Agreement (USMCA)*, Article 19.8.2 and 19.8.6

The APEC CBPR system member countries are the United States, Mexico, Japan, Canada, Singapore, Korea, Australia, Chinese Taipei and the Philippines, and more are expected to join besides these nine member countries. Not every country has many companies with the CBPR certification, yet many global enterprises have CBPR-certified already: *Apple, Inc.*, *Cisco Systems*, *Hewlett Packard Enterprise Company*, *IBM*, *MasterCard*, etc.[62] In case of *Apple*, its official website clearly states and informs the customers that *Apple* abides by the APEC CPBR system and enforces secure privacy safeguards with privacy and security guidelines. It also includes the link to file a report to a third-party dispute resolution provider, which is its accountability agent, *TrustArc*. Such digital-driven companies like *Apple* that the consumer privacy concerns and issues take up a big part in their businesses can reassure their customers with the CBPR certification and system.

[62] "TRUSTe Privacy Program Participants and Services." TrustArc (Feb. 2021)

# V. Development of Digital Trade Regulations in the RTAs

Some major countries in the world have increasingly put a restraint on cross-border information transfer and taken discriminatory measures against foreign companies for various reasons as cybersecurity and protection of domestic industries and online personal information. For global digital or tech companies, these measures that appeared differently for each country will act as another trade barrier. The main problem is that such digital trade barriers are difficult to be removed or reduced with the current multilateral mechanism of digital trade. Therefore, digitally competitive countries have become reliant upon the regional trade agreements (RTAs) where the expansive scope of trade liberalization can be pursued. In this chapter, digital trade agreements from four RTAs—CPTPP, USMCA, USJDTA and SADEA—will be discussed based on the significance and difference of main provisions.

## 1. Chapter 14 of CPTPP: Electronic Commerce

CPTPP, effectuated in 2018, is regarded as a significant RTA in digital trade because it was the first multilateral agreement that includes a separate chapter of "electronic commerce" concerning not only customs duties but also online consumer and personal information protection. It was particularly meaningful that the data trade was finally acknowledged and protected as trade under the international trade system. In

addition, the subjects for digital trade were defined more clearly compared to the *WTO Work Programme on E-Commerce*. Although the APEC also elicited the agreement on personal privacy protection at the international level through the APEC Privacy Framework, the CPTPP differed from the APEC framework in that it is legally binding.

The CPTPP involved several important implications for the international regulation on digital trade in terms of cross-border information transfer. First, by adding the provisions in regard to online consumers and personal information, the CPTPP demonstrated that the usage and protection of personal information have become extremely necessary elements of international trade. Consequently, the regulations on personal information protection would be expected to take crucial parts in further international agreements. Second, the CPTPP focused on transnational transfer of information, such as the prohibition of restrictions on information transfer and data localization, more than the protection level of personal information. This might have mostly reflected the position of the US, but the CPTPP is still worthwhile in view of the fact that, for the first time, the personal information protection was defined in the free trade agreement. Third, the CPTPP had emphasis on the free flow of information including personal information, almost unilaterally; therefore, it disturbed the existing system of checks and balances, between free transfer of information and personal information protection, that has been maintained in the world since the OECD Privacy Guidelines in 1980. This can be understood as the limitation of privacy regulations in the FTA that prioritizes free trade in goods and services. Although it needs further progress in such

regulations, the CPTPP has had and will have a tremendous impact on further negotiations and decisions of other multilateral or free trade agreements on digital trade.

## 2. Chapter 19 of USMCA: Digital Trade

Since Canada and Mexico are members of CPTPP, the main focus of attention was how different the digital trade regulations of USMCA would be, from those of CPTPP. In Chapter 19, the USMCA set out the provisions on digital trade, which were not provided in its previous agreement, NAFTA. Interestingly, unlike the CPTPP, the USMCA named the chapter "digital trade," instead of "electronic commerce," without explicitly defining "digital trade" in the chapter.[63] However, it defined "digital product" as "a computer program, text, video, image, sound recording, or other product that is digitally encoded, produced […] and that can be transmitted electronically," as stated in the CPTPP as well. The term, "digital product," in both CPTPP and USMCA replaced the concept of "electronic transmission" that the WTO had used in the *WTO Work Programme on E-Commerce*. This change clarified the confusion caused by the interpretation of "electronic transmission" that was somewhat unclear and undefinable.

Most of the provisions in the Chapter 19 of USMCA were structured similar to those of the CPTPP. However, relating the localization of computing facilities, the USMCA did not include an exception for "a legitimate public policy objective" while the

[63] Nohyoung Park and Myunghyun Chung, "Digital Trade and the Development of International Law," The Korean Journal of International Law, 63(4), The Korean Society of International Law (2018), 207

CPTPP stated in paragraph 3 of Article 14.13; instead, general exceptions for measures "necessary to protect public morals or to maintain public order" can be applied pursuant to Article XIV, paragraph (a) of GATS, according to ANNEX 19-A of the USMCA.[64] This exception of the USMCA based on the Article XIV of the GATS was understood to be more restrictive than that of the CPTPP and to require strict regulation on data localization.

## 3. US-Japan Digital Trade Agreement

The US-Japan Digital Trade Agreement (USJDTA), consisting of total 22 provisions without any preamble or annex, was signed along with the US-Japan Trade Agreement (USJTA) but considered as a completely separate treaty that solely concerned digital trade. Although the overall regulations appeared to be similar to the Chapter 19 of USMCA, several provisions and exceptions were newly added. The USJDTA stated exceptions specifically under each provision instead of applying the general exceptions of the GATS in the separate ANNEX in the end like USMCA. Considering that the US showed the inclination to apply minimal or limited level of exceptions in the USMCA, the explicit exceptions in this agreement were significant to be reviewed.

Regarding customs duties, the USMCA specified the moratorium on customs duties on "digital products" while the USJDTA applied to "electronic transmissions" as defined in the CPTPP. Also, unlike the USMCA, the USJDTA applied the exception of "intellectual property" and "foreign capital participation in an enterprise engaged in the

[64] *General Agreement on Trade in Services (GATS)*

supply of broadcasting" to non-discriminatory treatment. The USJDTA added new provisions such as prohibition on localization of "financial service computing facilities" and "information and communication technology goods that use cryptography," which were not regulated in neither CPTPP nor USMCA. In addition, some provisions like "paperless trading," "principles on access to and use of the internet" and "cooperation" from the CPTPP and USMCA were not included in the USJDTA *(Table 4)*. Meanwhile, the provision on "internet interconnection charge sharing" under Article 14.12 of CPTPP was excluded both in the USMCA and in the USJTDA. Supposedly, these provisions were lifted in the succeeding agreements for the reason that they covered considerably fundamental standards of digital trade. Above all, the most noticeable aspect in the agreement between the US and Japan was the enforceability of the regulations. Neither USJTA nor USJDTA included a formal dispute settlement mechanism to enforce such commitments. The Article 6 of the USJTA suggested 60-day consultations if any matter affects "the operation or interpretation of this agreement," yet it is unclear how this would work without any specific compliance or implementation provisions. In fact, even if there were such a provision, it might have been difficult to take it further to the WTO dispute settlement system due to the discrepancy in perceptions between the WTO agreements and the digital trade agreements. Therefore, it will be more practical to devise a new suitable dispute settlement procedure that facilitates dispute resolutions specific to digital trade. Yet, this agreement is still compelling because it involves the high standard of criteria from existing agreements in the US, and even beyond, and is expected to serve as a model of regulations that the US will conclude in the future.

***Table 4. Comparison of the Major Digital Trade Provisions in the RTAs***

| Categories | Main Provisions | CPTPP | USMCA | USJDTA | SADEA |
|---|---|---|---|---|---|
| Facilitation of E-Commerce | Moratorium on Customs Duties | O | O | O | O |
| | Non-Discriminatory Treatment | O | O | O | O |
| | Paperless Trading | O | O | O | O |
| Electronic Payments | Electronic Authentication and Electronic Signatures | Δ | Δ | - | O |
| | Electronic Invoicing | - | - | - | O |
| | Secure Cross-border Electronic Payments | - | - | - | O |
| Online Consumer Protection | Online Consumer Protection | O | O | O | O |
| | Personal Information Protection | O | O | O | O |
| | Unsolicited Commercial Electronic Messages | O | O | O | O |
| Free Cross-border Digital Activities of Enterprises | Cross-border Transfer of Information | O | O | O | O |
| | Localization of Computing Facilities | O | O | O | O |
| | Localization of Computing Facilities for Financial Services | - | - | - | O |
| | Prohibition of Source Code Transfer Request | O | O | O | O |
| | Free Access to and Use of the Internet | Δ | Δ | - | Δ |
| | Internet Interconnection Charge Sharing | Δ | - | - | Δ |
| | Data Innovation | - | - | - | Δ |
| | Cooperation in Artificial Intelligence | - | - | - | Δ |
| | Cooperation in FinTech and RegTech | - | - | - | Δ |
| | Information Exchange for Small and Medium Enterprises | - | - | - | Δ |

***Source:*** Compiled from the full texts of CPTPP, USMCA, USJDTA and SADEA
***Note:*** O - Mandatory Provision, Δ – Cooperative Provision (including *Endeavour* Obligation)

## 4. Singapore-Australia Digital Economy Agreement

The Singapore-Australia Digital Economy Agreement (SADEA) was the second agreement signed by Singapore in 2020, followed by Digital Economy Partnership Agreement (DEPA) with Chile and New Zealand. The SADEA replaced the original chapter of electronic commerce in the Singapore-Australia FTA and involved digital economy agreement with ANNEX A of digital economy and ANNEX B of preamble. The SADEA aimed to create efficient digital trading environment and to promote digital economy cooperation between countries, laying down a broader range of digital trade regulations. The agreement also embodies seven Memoranda of Understanding (MOUs) to implement the regulations for the projects in the areas of AI, digital identities, data innovation, personal data protection, e-invoicing, trade facilitation and e-certification of agricultural commodities.[65]

The regulations of SADEA are a combination of provisions in the digital trade agreements that were previously concluded—CPTPP, USMCA, USJDTA and DEPA, incorporating not only the essential rules but also the regulations on innovative subjects *(Table 4)*. It added the provisions like "paperless trading," "internet interconnection charge sharing" and "cooperation" that the USMCA and USJDTA excluded after the CPTPP. In addition, it restated the provisions of "data innovation" and "artificial intelligence" from DEPA more specifically, encouraging effort to promote both areas in a collaborative manner. The agreement also differs from CPTPP, USMCA and USJDTA in that it drives

[65] "The Singapore-Australia Digital Economy Agreement (SADEA)," Ministry of Trade and Industry Singapore

further cooperation and development in business with provisions on “small and medium enterprises (SMEs),” “stakeholder engagement” and “FinTech and RegTech cooperation.” The SADEA, at the moment, can be regarded as the most advanced digital trade agreement that covers a comprehensive extent of digital trade.

# VI. Assessment on Digital Trade Regulations in Korea

## 1. Global Digital Competitiveness of Korean Textile and Apparel Industry

Korea has been always listed in the sector of information technology and its businesses have continued to bring top performances in advanced technologies. For digital competitiveness, Korea ranked 8th in the world in 2020, which is 2 steps higher than the previous year.[66] Compared to the downturn of other top countries due to various factors, Korea improved across all factors with strong performance in "future readiness," specifically in the "adaptive attitude" and "business agility" sectors.[67] Korea preceded other countries with these factors for the agility of companies to manage threats and opportunities and for the use of big data and analytics in their businesses. This indicates that Korea is one of the major players with potentials and possibilities for further advancement in digital technology.

Three countries in Asia have been listed in top 10 on the list for overall digital competitiveness in 2020: Singapore, Hong Kong and Korea.[68] Singapore ranked 2nd overall after the US for its regulatory and technological frameworks.[69] As mentioned in the previous chapter, Singapore has two digital economy agreements with another digital

[66] IMD World Digital Competitiveness Ranking 2020, IMD World Competitiveness Center (2020), 18–23
[67] Ibid.
[68] Ibid.
[69] Ibid.

partnership agreement currently in the process of negotiation, aside from CPTPP, RCEP and several FTAs. The leading economies in the digital sector such as the US and Singapore not only focus on strengthening the knowledge infrastructure to employ digital technologies but also provide effective regulatory frameworks that enable the development and introduction of technologies under mutual cooperation.

As mentioned in Chapter III, many Korean brands have introduced advanced technologies relating to fashion such as a self-heating fabric and a tag inside the suit that can connect to a phone. One of the Korean fashion giants, *Samsung C&T Fashion Group,* launched a brand called *the humanfit*, a platform that incorporates technology into fashion products, in 2015. *The humanfit* has introduced garments and accessories based on information and digital technology associated with smartphones, collaborating with diverse brands; a smart suit of *Rogatis* with a NFC chip to connect to a smartphone, a smart belt of *WELT* with a function of fitness tracking, a workout outfit called *Body Compass* to track every movement from breathing to muscle contraction, a solar-powered handbag called *Sol Bag* of *Ravenova* and shoes from *KUHO* with a NFC function available to verify the authenticity. In addition, *Kolon Corporation*'s affiliate, *Kolon Glotech* has introduced a self-heating fabric, *HeaTex*, and *Kolon Industries F&C*, another fashion giant, has created the wearable technologies, *Life Tech Jacket,* with the *HeaTex* material and several tech features. The textile and apparel industry of Korea has greatly improved, benefiting from its strong technological skills, competitive manufacturing sector and innovative designs. With the "future readiness" for digital competitiveness and the market trend,

Korean fashion-related companies will continue to explore the area of fashion with digital technologies.

Korea is also a large and important market of textile and apparel trade. In 2019, Korea was the 17th largest countries in the world in exports of textile and clothing and the 12th largest in imports. Especially for the exports of textiles, Korea ranked 7th in the world, which is higher than Vietnam (8th), Japan (11th) and France (15th). Given that these countries have been competitive in the market, Korea's exporting size in textiles is considered meaningful. Asia is a big market for textiles and manufacturing sector, and Korea made the 3rd most contribution to textile and apparel trade after China and India. In addition, Korea has introduced innovative textile technologies to the world such as nanofibers, antibacterial fabrics, elastic fibers, thermostatic and other high-functional fabrics. Moreover, for technology capabilities, Korea ranked 10th in both innovation inputs and outputs among 131 economies and 2nd among 7 economies in Asia and Oceania.[70] Since the level of technological innovation and "future readiness" of business are all set, the efforts at establishing a robust legal framework will make Korea more digitally competitive in the world.

## 2. Digital Trade Regulations at the International Level

Notwithstanding the advancement at the international level, Korea has been somewhat passive about expanding and specifying digital trade regulations. Korea started

[70] *Global Innovation Index 2020: Republic of Korea*, World Intellectual Property Organization (WIPO), 1–2

to make progress in adopting digital trade regulations like the exemptions on customs duties on electronic transmissions in Korea-Singapore FTA (KSFTA); however, the mandatory provisions were biased towards a fundamental and conventional aspect of e-commerce facilitation, and online consumer and personal information protection were mostly cooperative provisions *(Table 5)*. Also, the provision that ensures free cross-border activities of enterprise was hard to find except in a few FTAs like Korea-US FTA and Korea-Canada FTA. Yet, even the Korea-US FTA included the restraints on imposing barriers to cross-border information transfer as an "endeavour" obligation while other RTAs like CPTPP and USMCA stated it as a mandatory clause.

This regulatory status of digital trade at the international level does not correspond to the country's overall level of information technology (IT) and size of the trade. Considering the level of technology and domestic market, Korean businesses may eventually lose global competitiveness in the future with its focus on data sovereignty regulations; now that data analytics and digital technologies become key strategies in all businesses, its regulatory status can hinder Korean companies from further advancements including technological development and overseas expansion. Even though Korea-US FTA has been considered as one of the advanced FTAs of Korea in terms of digital trade standards, Korea still needs further efforts to expand its scope of digital trade regulations through other multilateral or regional trade agreements. The ongoing negotiation with Singapore for Korea-Singapore Digital Partnership Agreement (KSDPA) is expected to make more progress in this aspect and include a wider scope of regulations, but at this rate, it is concerned that Korea may remain at the extent of existing digital trade regulations.

***Table 5. Comparison of Digital Trade Regulations in Korea FTAs and other RTAs***

| | | KOREA FTAs | | | | | RTAs (Digital Trade Agreements) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Categories** | **Main Provisions** | **KOR-EU** | **KOR-US** | **KOR-TUR** | **KOR-CHN** | **KOR-VNM** | **CPTPP** | **USMCA** | **USJDTA** | **SADEA** |
| Facilitation of E-Commerce | Exemption of Customs Duties | O | O | O | O | O | O | O | O | O |
| | Non-Discriminatory Treatment | - | O | - | - | - | O | O | O | O |
| | Electronic Authentication and Electronic Signatures | △ | O | O | O | △ | O | O | O | O |
| | Paperless Trading | △ | △ | △ | △ | △ | △ | △ | - | O |
| Online Consumer Protection | Online Consumer Protection | △ | △ | △ | - | △ | O | O | O | O |
| | Personal Information Protection | △ | - | △ | O | △ | O | O | O | O |
| | Unsolicited Commercial Electronic Messages | △ | - | △ | - | - | O | O | O | O |
| Free Cross-border Transfers and Digital Activities | Cross-border Transfer of Information | - | △ | - | - | - | O | O | O | O |
| | Location of Computing Facilities | - | - | - | - | - | O | O | O | O |
| | Prohibition of Source Code Transfer Request | - | - | - | - | - | O | O | O | O |
| | Free Access to and Use of the Internet | - | △ | - | - | - | △ | △ | - | △ |
| | Internet Interconnection Charge Sharing | - | - | - | - | - | △ | - | - | △ |
| | Interactive Computer Services | - | - | - | - | - | - | O | O | - |

***Source:*** Compiled from the full texts of RTAs (and FTAs) listed above
***Note:*** O - Mandatory Provision, △ – Cooperative Provision (including *Endeavour* Obligation)
*FTAs selected based on the size of textile and apparel trade with Korea. (in order by effective date)

# VII. Conclusion

The level of digital trade has reached the greatest share of the global trade and it will continue to proliferate through a perpetual progress of digital transformation. The textile and apparel industry is one of the most promising industries for digital transformation with its renowned brands and their large market and demand. The industry's inherent nature of crafts and creativity has caused a delay of digital escalation; however, the digital technologies were already being grafted onto fashion in the area of digital platforms, wearable devices, smart textiles and AR, VR and 3D apparatuses, presenting the extensive possibility of further development through digital transformation. In addition, the digital technologies can be widely applied to the entire process of business, including design and supply chain management, thereby reducing costs and time to market that is key value to a business of the particular industry.

The outbreak of the COVID-19 has intensified the digital surge and caused significant upheaval to digital transformation in the textile and apparel industry. As the importance of digital transformation is highlighted, the relevant regulatory framework is emphasized as an urgent necessity due to various transnational issues and crimes that have gotten out of hand. The digital trade regulations are extremely vital in a fashion-related business because the business handles and collects a wide range of personal information including biometric data such as body measurements, patterns of movements and fitness or health information that are identifiable and highly private. Many multilateral organizations set out the principles or guidelines on digital trade at the international level,

yet they are not broad and specific enough to cover pervasive problems and to follow up with the pace of digital development. Therefore, countries strived to settle such drawbacks through regional trade agreements, establishing an independent chapter of digital trade regulations to deal with addressed issues.

In the past few years, the digital trade regulations in the RTAs have expanded in scope from free transfer of information and personal information protection to data innovation and artificial intelligence. The major digital trade agreements, the CPTPP, USMCA, USJDTA and SADEA, include advanced level of regulations on digital trade that promote cooperation in business activities between countries under open and safe environment. There are still rooms for improvement in these agreements: the elimination of a blind spot for regulations, the establishment of more specific conditions to prevent abuse of exceptions and the installation of the dispute settlement procedure specialized to digital trade. However, the agreements are expected to work as a stepping stone to proceed further international digital trade negotiations until the foundation of robust regulatory framework.

Korea is one of the few markets that have high capacity for both IT technology and fashion. The digital wearables and smart textiles have been especially developed with advanced technologies by leading companies in Korea. As the digital transformation accelerates in the Korean textile and apparel businesses, related rules and system need to be prepared accordingly to provide them with extensive opportunities and protection measures. However, Korea has taken a relatively passive attitude in adopting digital trade regulations, especially in the breakdown of trade barriers for free data transfers, compared

to other digital competitive countries like the US and Singapore. In other words, its current regulatory extent does not accord with the pace of global technological advancement of Korea.

Many countries have recently expressed strong interests in securing regulatory authority as well as establishing digital trade regulations. Moreover, cybersecurity regarding cybercrimes and data breaches has continued to raise serious concerns and issues. It is important to understand that the market and digital competitiveness of each country can derive different views on digital trade regulations and to put efforts into reducing such discrepancies of perception between countries. The international regulatory framework on digital trade needs to be strongly structured and developed in expansive scope and specific terms of regulations, harmonizing free digital trade and consequential issues like transfers of sensitive data. In the meantime, RTAs are the most efficient regulatory measures of digital trade, yet the world will ultimately need the unified international law on digital trade in the very near future.

This paper examined the major digital trade regulations of multilateral organizations and RTAs but, due to the lack of precedent in digital trade of the textile and apparel industry, cases on application and enforcement of such regulations were excluded. However, it is significant to have comprehensively reviewed the increasing digital issues of textile and apparel industry and the current digital trade regulations at the international level. Several issues are still left to be discussed in further studies once the international regulatory framework on digital trade becomes settled and practical.

# BIBLIOGRAPHY


Abe, Y., and D. Collins. "The CPTPP and Digital Trade: Embracing E-Commerce Opportunities for SMEs in Japan and Canada." *Transnational Dispute Management*, 2018.

Amed, Imran, et al. McKinsey & Company, 2019, pp. 13–81, *The State of Fashion 2020*.

Amed, Imran, et al. McKinsey & Company, 2020, pp. 6–34, *The State of Fashion 2020 Coronavirus Update*.

*APEC Cross-Border Privacy Rules System: Policies, Rules and Guidelines*, Official Document, pp. 2–13.

*Australia-Singapore Digital Economy Agreement* , Official Document, pp. 1–39.

Beedham, Matthew. "Nike Now Holds Patent for Blockchain-Based Sneakers Called 'CryptoKicks'." *Hard Fork  The Next Web*, 10 Dec. 2019, thenextweb.com/hardfork/2019/12/10/nike-blockchain-sneakers-cryptokick-patent/.

Beltrami, Marco, et al. McKinsey & Company, 2018, pp. 11–21, *The State of Fashion 2019*.

"Benefits of the APEC Cross-Border Privacy Rules." *The APEC CBPRs: Protecting Information, Driving Growth, Enabling Innovation*, C&M International, Jan. 2019.

Bhattarai, Abha. "Virtual Try-Ons Are Replacing Fitting Rooms during the Pandemic." *The Washington Post*, WP Company, 11 July 2020, www.washingtonpost.com/business/2020/07/09/virtual-try-ons-are-replacing-fitting-rooms-during-pandemic/.

Biondi, Annachiara. "Fashion and Luxury Face $600 Billion Decline in Sales." *Vogue Business*, Vogue Business, 28 Mar. 2020, www.voguebusiness.com/companies/bcg-luxury-spending-drop-coronavirus-covid-19#:~:text=Luxury%20brands%20should%20brace%20for,and%20%24600%20billion%20in%20sales.

Callo-Müller María Vasquez. “GDPR and CBPR: Reconciling Personal Data Protection and Trade.” *APEC Policy Support Unit Policy Brief*, no. 23, Oct. 2018.

Caramanica, Jon. “Barneys Is Gone. Where Should You Shop Next?” *The New York Times*, The New York Times, 4 Dec. 2019, www.nytimes.com/2019/12/04/fashion/barneys-is-gone-where-should-you-shop-next.html.

CB Insights. “The Future of Fashion: Technology & the Industry.” *CB Insights Research*, CB Insights, 13 Oct. 2020, www.cbinsights.com/research/fashion-tech-future-trends/.

*“Chapter 11 - Bankruptcy Basics.” United States Courts, www.uscourts.gov/services-forms/bankruptcy/bankruptcy-basics/chapter-11-bankruptcy-basics.*

*Comprehensive and Progressive Agreement for Trans-Pacific Partnership, Chapter 14 Electronic Commerce*, Official Document, pp. 14–1-14–10.

Costello, Katie. “Gartner Says Worldwide Wearable Device Sales to Grow 26 Percent in 2019.” *Gartner*, 29 Nov. 2018, www.gartner.com/en/newsroom/press-releases/2018-11-29-gartner-says-worldwide-wearable-device-sales-to-grow-.

CTI Sub-Fora & Industry Dialogues Groups, Digital Economy Steering Group(DESG), 2017, *APEC Privacy Framework (2015)*.

“Data Sovereignty and the Cloud.” *IT Governance*, www.itgovernance.co.uk/data-sovereignty-and-the-cloud.

*Declaration on Global Electronic Commerce, WT/MIN(98)/DEC/2*, World Trade Organization, 1998.

*Digital Economy Partnership Agreement*, Official Document, pp. 1–16-5.

“Digitization vs. Digitalization: Differences, Definitions and Examples.” *TruQC*, 22 May 2019, www.truqcapp.com/digitization-vs-digitalization-differences-definitions-and-examples/.

“DIRECTIVE 95/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.” *Official Journal of the European Communities*, 24 Oct. 1995.

“Electronic Commerce.” *World Trade Organization*, www.wto.org/english/tratop_e/ecom_e/ecom_e.htm.

"Even 180-Year Old Hermès Cannot Avoid an Emphasis on E-Commerce." *The Fashion Law*, 25 Mar. 2020, www.thefashionlaw.com/even-180-year-old-herms-cannot-avoid-e-commerce/.

"From the 'New Normal' to a 'New Future': A Sustainable Response to COVID-19." *World Health Organization*, World Health Organization, 13 Oct. 2020, www.who.int/westernpacific/news/commentaries/detail-hq/from-the-new-normal-to-a-new-future-a-sustainable-response-to-covid-19.

Garcia, Tonya. "Stitch Fix IPO: 5 Things to Know about Online Clothing Service." MarketWatch, MarketWatch, 18 Nov. 2017, www.marketwatch.com/story/5-things-to-know-about-subscription-clothing-service-stitch-fixs-ipo-2017-10-20.

*General Agreement on Trade in Services (GATS)*, WTO Official Document.

"Generation Z News: Latest Characteristics, Research, and Facts." *Business Insider*, Business Insider, www.businessinsider.com/generation-z#terms.

"Global Smartwatch Unit Sales Forecast 2018-2023." *Statista*, 14 Jan. 2021, www.statista.com/statistics/878144/worldwide-smart-wristwear-shipments-forecast/.

Holst, Arne. "Wearable Technology - Statistics & Facts." *Statista*, 9 Mar. 2020, www.statista.com/topics/1556/wearable-technology/.

Hämmerle, Volker, et al. "Why Fashion Must Go Digital-End to End." *BCG*, Boston Consulting Group, 30 Jan. 2020, www.bcg.com/en-kr/publications/2020/why-fashion-must-go-digital-end-to-end.

IMD World Competitiveness Center, 2020, pp. 18–23, *IMD World Digital Competitiveness Ranking 2020*.

Ismail, Yasmin. International Institute for Sustainable Development, 2020, *E-Commerce in the World Trade Organization: History and Latest Developments in the Negotiations under the Joint Statement*.

Jeffries, Stuart. "Internet Anonymity Is the Height of Chic." *The Guardian*, Guardian News and Media, 12 June 2013, www.theguardian.com/technology/2013/jun/12/internet-anonymity-chic-google-hidden.

Kim, Jae-heun. "Will Chanel Follow Hermes to Sell Handbags Online?" *The Korea Times*, 15 June 2020,

www.koreatimes.co.kr/www/tech/2020/08/694_291200.html#:~:text=Hermes%2C%20which%20launched%20its%20online,day%20the%20service%20was%20launched.retailinasia.com/in-tech/hermes-to-update-digital-strategy/.

Kirk, Jeremy. "Nordstrom Blames Breach of Employee Data on Contractor." *Bank Information Security*, 14 Nov. 2018, www.bankinfosecurity.com/nordstrom-says-contractor-mishandled-employee-data-a-11701.

*Korea-China FTA*, Official Document.

*Korea-EU FTA*, Official Document.

*Korea-Turkey FTA*, Official Document.

*Korea-US FTA, Chapter 15 Electronic Commerce*, Official Document, pp. 15–1-15–4.

*Korea-Vietnam FTA*, Official Document.

Kwak, Dongchul. "A Study on the Changes of the Trading Regime and the Development of Trade Law in the Wake of COVID-19." *International Trade Law*, International Legal Affairs Division, Ministry of Justice, 2020, pp. 76–113.

Kwak, Dongchul. "Digital Trade in Analogue Regime: Liberalization of Digital Trade and the Role of Trade Agreements." *Seoul National University*, 2015.

Lee, JongSeok. "The Reasons Why the Establishment of Global Digital Trade Rule Has Been Delayed and the Implications on Korean Digital Trade Policy." *Korea Logistics Review*, vol. 29, no. 1, Feb. 2019, pp. 63–80.

Lee, Joo Hyoung. "A Study on the US-Japan Digital Trade Agreement and Exceptions Provisions." *Korea Journal of International Economic Law, 17(3)*, Korean Society of International Economic Law, 2019, pp. 155–185.

Lee, Julie Yoonnyung. "The South Koreans Left behind in a Contact-Free Society." *BBC Worklife*, BBC, 6 Aug. 2020, www.bbc.com/worklife/article/20200803-south-korea-contact-free-untact-society-after-coronavirus#:~:text='Untact'%20%E2%80%93%20a%20combination%20of,online%20or%20making%20contactless%20payments.

Mangan, Dan. "There's a Hack for That: Fitbit User Accounts Attacked." *CNBC*, CNBC, 8 Jan. 2016, www.cnbc.com/2016/01/08/theres-a-hack-for-that-fitbit-user-accounts-attacked.html.

McIntosh, Steven. “Coronavirus: Why the Fashion Industry Faces an 'Existential Crisis'.” *BBC News*, BBC, 29 Apr. 2020, www.bbc.com/news/entertainment-arts-52394504.

McKinsey & Company, 2018, *Unlocking Success in Digital Transformations*.

Min, Hanbit. “Digital Trade and Trade Norms: Analysis on the Data Trade Norms of USMCA.” *Law Research, 63*, Law Research Institute Chonbuk National University, 2020, pp. 469–496.

Montgomery, Angus. “SeymourPowell Creates Jacket with Wind-Turbine Generator.” *Design Week*, 6 Feb. 2015, www.designweek.co.uk/issues/february-2014/seymourpowell-creates-jacket-with-wind-turbine-generator/.

“New Smart Shoes from Nike.” *Wearable Technology Insights*, IDTechEx, 21 Jan. 2019, www.wearabletechnologyinsights.com/articles/16320/new-smart-shoes-from-nike.

Park, Nohyoung, and Myunghyun Chung. “Digital Trade and the Development of International Law.” *The Korean Journal of International Law, 63(4)*, The Korean Society of International Law, 2018, pp. 197–216.

Park, Nohyoung. “A Launch of International Rules for Trade in Data: the Significant Implications of TPP.” Anam Pŏphak, 2016, pp. 53–87.

“Planet of the Phones.” *The Economist*, The Economist Newspaper, 26 Feb. 2015, www.economist.com/leaders/2015/02/26/planet-of-the-phones.

*Proposal for a Regulation of the European Parliament and of the Council on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data (General Data Protection Regulation) - Preparation of a general approach*, Council of the European Union, 2015.

“Retail Woes: A Running List of Fashion & Retail Bankruptcies.” *The Fashion Law*, 27 Jan. 2020, www.thefashionlaw.com/retail-woes-a-bankruptcy-timeline/.

Rotari, Elena, and Corina Negara. “Possibilities and Applications of Smart Textiles.” *MATEC Web of Conferences*, vol. 112, no. 04025, 2017, pp.1-6., doi:10.1051/matecconf/201711204025.

Sabanoglu, Tugba. “U.S. Online Subscription Box Brands by Visits 2017.” *Statista*, 1 Dec. 2020, www.statista.com/statistics/490610/most-visited-subscription-boxes-usa/.

"SAFEGUARDING INFORMATION." *Office of Privacy and Open Government, U.S. Department of Commerce*, www.osec.doc.gov/opog/privacy/PII_BII.html.

Seo, Jee-yeon. "High-End Suit Brand Offers Smart Solutions." *The Korea Herald*, 30 Sept. 2014, www.koreaherald.com/view.php?ud=20140930001078.

Shaulova, Esther, and Lodovica Biagi. "Fashion ECommerce Report 2020." *Statista*, Nov. 2020, www.statista.com/study/38340/ecommerce-report-fashion/#:~:text=Fashion%20is%20the%20largest%20B2C,by%20the%20end%20of%202025.

Shyamkumar, Prashanth, et al. "Wearable Wireless Cardiovascular Monitoring Using Textile-Based Nanosensor and Nanomaterial Systems." *Electronics*, vol. 3, 2014, pp. 504–520., doi:10.3390/electronics3030504.

"The Singapore-Australia Digital Economy Agreement (SADEA)." *Ministry of Trade and Industry Singapore*, www.mti.gov.sg/Improving-Trade/Digital-Economy-Agreements/The-Singapore-Australia-Digital-Economy-Agreement.

"Smart Series Part 3 : When Fashion and IT Collide - Wearables Take the Next Step." *Samsung C&T Newsroom*, 23 Aug. 2016, news.samsungcnt.com/smart-series-part-3-fashion-collide-wearables-take-next-step/.

"The State of Fashion 2021: In Search of Promise in Perilous Times." *McKinsey & Company*, McKinsey & Company, 3 Dec. 2020, www.mckinsey.com/industries/retail/our-insights/state-of-fashion.

"Stitch Fix Algorithms Tour." *Stitch Fix*, algorithms-tour.stitchfix.com/.

"Strike! Rogatis' Smart Suit Scores Ten Pins out of Ten for Business-Leisure Transition." *Samsung C&T Newsroom*, 2 Nov. 2016, news.samsungcnt.com/strike-rogatis-smart-suit-scores-ten-pins-out-of-ten-for-business-leisure-transition/.

Tidy, Joe. "Garmin Begins Recovery from Ransomware Attack." *BBC News*, BBC, 27 July 2020, www.bbc.com/news/technology-53553576.

"TRUSTe Privacy Program Participants and Services." *TrustArc The Leader in Privacy Management Software*, 1 Feb. 2021, trustarc.com/consumer-info/trusted-directory/#apec-list.

"UN Chief Says Coronavirus Worst Global Crisis since World War II." *France 24*, 1 Apr. 2020, www.france24.com/en/20200401-un-chief-says-coronavirus-worst-global-crisis-since-world-war-ii.

*United States–Mexico–Canada Agreement, Chapter 19 Digital Trade*, Official Document, pp. 19–1-19-A-1.

*US-Japan Digital Trade Agreement*, Official Document, pp. 1–19.

Wong, Rebecca. Springer, 2013, *Data Security Breaches and Privacy in Europe*.

World Intellectual Property Organization (WIPO), pp. 1–2, *Global Innovation Index 2020: Republic of Korea*.

"WTO Moratorium on Customs Duties on Electronic Transmissions – A Primer for Business." *ICC*, International Chamber of Commerce, 2019 iccwbo.org/publication/wto-moratorium-on-customs-duties-on-electronic-transmissions-a-primer-for-business/.

Wurmser, Yoram. "Wearables 2019." *Insider Intelligence*, Insider Intelligence, 3 Jan. 2019, www.emarketer.com/content/wearables-2019

# 국문초록

## 섬유 · 의류 산업의 디지털 전환:
### 디지털 통상규범과 제도

정 예 슬

디지털 전환은 급변하는 사회에서 살아남기 위한 기업의 필수 전략이 되었다. 이는 다양한 분야에서 광범위하게 일어나고 있으며, 특히 코로나바이러스 대유행으로 인해 급속도로 확산되고 있다. 그중에서도 섬유 · 의류 산업의 디지털 전환은 비즈니스 효율성 향상을 위해 그 필요성이 꾸준히 언급되어 왔다. 그러나 디자인, 생산, 판매 등 전통적인 방식을 고수할 수밖에 없는 산업의 특성상 모든 기업에서 쉽게 진행되기는 어려웠다. 하지만 계속되는 산업 침체와 코로나바이러스의 여파로 인하여 디지털 전환의 중요성이 더욱 강조되고 있다.

최근 여러 국가와 기업에서 디지털 전환과 정보통신기술에 대한 관심과 집중이 더욱 급증하고 있다. 그러나 증가하는 디지털 기술의 활용과는 달리 그에 따른 법적 쟁점 등 결과에 대한 해결책이 마련되지 않아 심각한 문제와 우려를 낳고 있다. 섬유 · 의류 산업의 디지털 전환이 권장되고 그 중요성이 강조되고 있는 가운데 이러한 문제점들은 글로벌 디지털 경쟁력을 키워가고 있는 기업에게 큰 장애물로 작용할 수밖에 없다. 또한 디지털 무역은 지금 이 순간에도 꾸준히 일어나고 있기 때문에 그 범위와 속도를 가늠하기가 매우 어렵다. 따라서, 국경 간 디지털 교역에서 발생할 수 있는 문제를 방지하고 규제하는 체계적인 법적 틀은 갖는 것이 매우 중요하다.

디지털 통상에 대한 국제 규범은 여전히 협력과 개선이 필요한 혼란 상태에 있다. 본 논문은 현 국제 디지털 무역 규제를 조사하고 더욱 발전시켜 산업에 실질적으로 적용 가능한 세부적이고 실용적인 국제법을 가져야 한다는 내용을 강조하고 있다.

다자무역협상에서 다루어져야 할 국제 규제를 현재 지역무역협정으로 대신하고 있지만, 시간이 지남에 따라 더욱 광범위한 디지털 전환이 이루어질 것이므로 각국은 국내산업을 보호하려는 견해와 디지털 무역장벽을 무너뜨리려는 견해 차이를 조정하여 보다 구체적이고 확실한 다자적 차원의 국제 규범을 세우려는 자세를 가져야 할 것이다.

주제어: 디지털 전환, 섬유 · 의류 산업, 디지털 통상, 디지털 통상규범, 디지털 통상협정

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