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A Systematic Review of Green and Digital Transitional Factors in the Fashion Industry

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Abstract

Background: The fashion industry's current manufacturing approach raises various environmental and social concerns, including but not limited to carbon emissions, resource depletion, waste generation, substantial energy consumption, and labour exploitation. Green and digital fashion can minimise these issues. However, fashion's green and digital shifts need more coverage. **Objectives:** This paper aims to observe and explore the key elements of green and digital transitions in the fashion industry. **Methods/Approach:** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, this systematic review study examined articles on green and digital transformations in the fashion supply chain from 2012 to 2022 in relevant indexation services. The researchers used descriptive and content analysis to explain the results from 46 of the 518 publications that were relevant to their study. **Results:** The study uncovered green transforming factors such as green materials, green energy, cleaner production, and others, as well as digital shifting factors like artificial intelligence, the Internet of Things (IoT), and robotics. **Conclusions:** This study's findings can assist practitioners and policymakers in integrating digital and green technologies into the fashion industry. Moreover, this study identified several research gaps that, if addressed, could have significant practical implications for the future of the fashion industry.

Keywords: Green transition, Digital transition, Fashion industry, Systematic review

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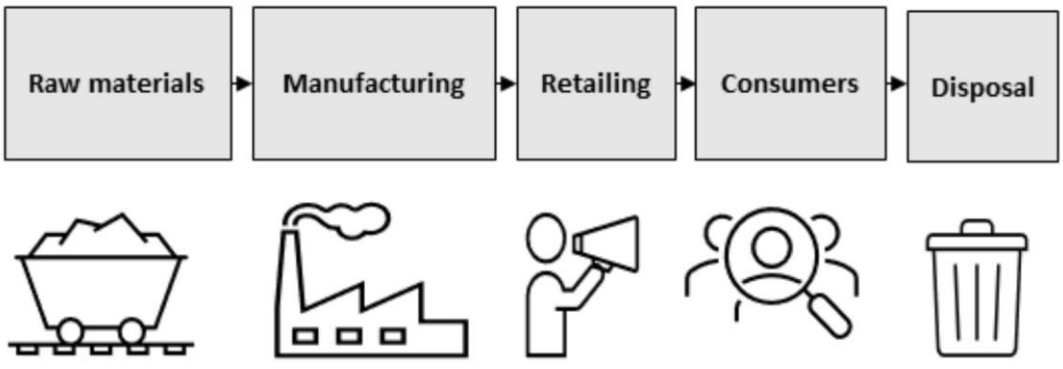
Introduction

The fashion manufacturing industry is crucial to fostering a country's economic development because it meets basic human needs through clothing production and creates job opportunities (Noor et al., 2022). Across the supply chain, the apparel industry generates income for more than 300 million people and is worth USD 1.3 trillion (Ellen MacArthur Foundation, 2017). However, the fashion supply chain is also the primary source of environmental pollution and carbon emissions due to its high water, energy, chemical, and non-renewable resource consumption (Šajn, 2019; Yu et al., 2021). The conventional fashion supply chain (Figure 1) operates under a linear model known as the "take-make-dispose" paradigm, wherein raw materials are harvested, transformed into useable goods in the factory, shipped to retailers, sold to consumers, and discarded at the end of their lifecycle(Ellen MacArthur Foundation, 2017; Presley & Meade, 2018). The current linear fashion approach generates several ecological and social problems, contributing to 8% of the world's carbon emissions and 20% of wastewater (Brydges, 2021; To et al., 2019). Besides, the industry is often criticised for its unfair treatment of workers and complex supply chain(Presley & Meade, 2018). Therefore, there is a pressing need to switch to a textile system that improves economic, social, and environmental outcomes (Desore & Narula, 2018; Ellen MacArthur Foundation, 2017). The fashion industry has the potential to drastically cut its carbon footprint by shifting to renewable energy and closing the loop on fashion models(Hiller Connell & Kozar, 2017). Closing the loop system is based on circular principles, emphasising maximising the lifespan of products and materials through reuse and the recovery and regeneration of products at the end of their useful lives(Brydges, 2021). Closing the loop fashion approach (Figure 2) is characterised by the utilisation of environmentally friendly materials, as well as sustainable production and retailing practices, promoting sustainable consumption through recycling, reusing, and repurposing(Ellen MacArthur Foundation, 2017; O'Reilly & Kumar, 2016) Adopting digital technologies and a greener approach to business practices can reduce resource consumption and carbon dioxide emissions and promote sustainability (Rosa et al., 2020).

Figure 1
Traditional Fashion Supply Chain



Source: Authors' analysis based on Ellen MacArthur Foundation (2017) and Presley & Meade (2018)

Although some differences exist between the fashion, apparel, and textile industries, this study has employed them interchangeably. The textile business involves several components, such as fibres, yarns, and fabrics, while the apparel industry

focuses explicitly on stitching to produce garments(Majumdar et al., 2020; Nayak et al., 2020). On the other hand, the fashion industry revolves around design and creativity, encompassing both the clothing and footwear sectors(Papahristou & Bilalis, 2017; Peters et al., 2021).

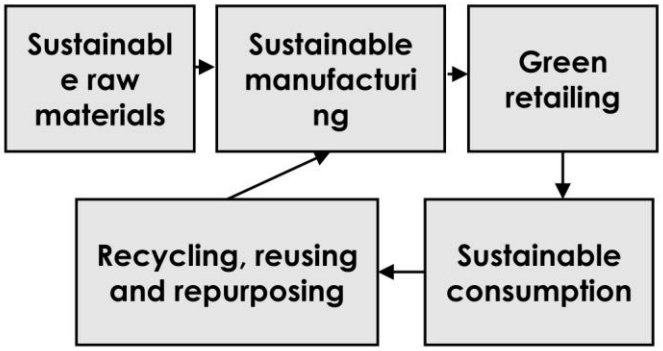
The "green transition" is a shift from excessive energy consumption and greenhouse gas emissions toward a more environmentally friendly economy (Ikram, 2022). It is a transformation from a linear approach to a circular economy model based on the closing-the-loop approach that can minimise resource consumption and promote sustainable development(Michel & Lee, 2017). The circular model incorporates sustainability initiatives at every stage of the economy(Mishra et al., 2020). This includes eco-design, green materials, green manufacturing, and reduction, reuse, and recycling programs. Several global initiatives to fight climate change (Kannan et al., 2022; Ortega-Gras et al., 2021) support the green and digital transition. These include the Paris Agreement, the 2030 Agenda for Sustainable Development, the EU Digital Strategy, and the European Green Deal. A green transition involves adopting sustainable materials, processes, and technologies. Thus, this study implies a green transition in the fashion industry by undertaking a sustainability movement across the fashion supply chain, which can reduce CO_2 emissions, water consumption, and other material consumption.

On the other hand, the digital transition is the implementation of digital tools and technologies in the industrial process to improve efficiency, reduce waste, and make the supply chain more open and transparent. It affects every aspect of business, including organisations, current and prospective business models, business process management, ecological systems, products, and services (Furjan et al., 2020). Emerging digital technologies enable and drive organisations to promote a green business strategy, which increases productivity and profitability (Papahristou & Bilalis, 2017; Wynn & Jones, 2022). Technological applications such as artificial intelligence, blockchain, 3D printing, and cloud computing can enhance fashion sustainability (Casciani et al., 2022; Ortega-Gras et al., 2021). Researchers in earlier studies have pointed out how vital green and circular economies are in the fashion supply chain, where digital technologies help to incorporate green models (Furjan et al., 2020; Rosa et al., 2020; Wynn & Jones, 2022). The COVID-19 pandemic has also drawn attention to the importance of advancing digital technologies in the worldwide fashion supply chain. (Casciani et al., 2022; Khurana, 2022). This study describes the digital transition as integrating intelligent technologies into the operations of the fashion industry to boost operational efficiency and transparency and decrease waste. Digital technologies transform traditional manufacturing operations into intelligent and efficient production systems (Ortega-Gras et al., 2021). Therefore, the digital transition is essential to foster industrial innovation and enhance sustainability in the textile industry.

Overall, the green and digital transition is a long and complicated process (Kazancoglu et al., 2020; Lüthje, 2021; Ortega-Gras et al., 2021). However, fashion enterprises have the potential to enhance their competitiveness, bolster their brand reputation, and foster innovation and growth in a market that is becoming more complex and changing constantly by using green practices and digital technologies(Casciani et al., 2022; Papahristou & Bilalis, 2017; Yu et al., 2021). Greener fashion approaches, such as eco-friendly materials, cleaner production, renewable energies and R principles, reduce waste, energy consumption, and pollution while enhancing financial gains(Ikram, 2022; Zamfir et al., 2022). Additionally, integrating digital technologies such as 3D modelling, blockchain, and virtual and augmented reality in the fashion supply chain can mitigate the wastage of raw materials during

the physical sample process, expedite the manufacturing cycle, foster innovative design approaches, and lower production costs (Bag et al., 2021; Bertola & Teunissen, 2018; Sayem, 2022).

Figure 2
Closing the Loop Fashion Model



Source: Authors' analysis based on Ellen MacArthur Foundation (2017) and O'Reilly & Kumar (2016)

Under these circumstances, the textile manufacturing sector's twin green and digital transitions are crucial to making the industry more sustainable (Tsai, 2018). A green and digital transition can reduce energy and resource use, emissions, and waste in the manufacturing processes of the fashion industry. It can solve problems caused by the garment business. That is why a green and digital transition is necessary to address the environmental and social challenges of the fashion manufacturing industry. Adopting sustainable and digital practices can improve a company's bottom line, CSR, creativity, and public image. Advanced economies and a few emerging economies continue to dominate the shift to green and digital technologies (Bianchini et al., 2022; Nyangchak, 2022). Though developing and underdeveloped countries have less focus on greening and digital technology, there is a rising trend toward adopting green and digital shifts in the textile and apparel industries of India, Bangladesh, Vietnam, and Ethiopia (Khurana, 2022; Nyangchak, 2022). China has taken several initiatives, like environmental regulation, to foster green and digital technologies in the manufacturing sector. A more in-depth understanding of the essential components of green and digital transformation in the fashion sector is becoming increasingly important, considering the pressing need to reduce carbon emissions, energy use, and resource use. The fashion industry is undergoing a green and digital transition simultaneously. Despite extensive research on the multiple factors involved, more systematic reviews with a more comprehensive approach are required to combine this information. A review and synthesis of the most recent scientific studies can help determine green and digital trends in the fashion industry. Therefore, this systematic literature review aims to gain insight into the critical elements of green and digital transitions in the fashion industry from the multidisciplinary literature. The researchers focused on the following research questions while writing this review:

- RQ1. What are the essential components of a green transition in the fashion industry?
- RQ2. Which aspects of the digital transformation of the fashion industry have been highlighted in the existing literature as being particularly crucial?

However, there is a great deal of literature on green and digital transitions, for example, related to fashion circularity (Furferi et al., 2022); green fashion (Andaregie & Astatkie, 2022; Bailey et al., 2022; Brydges, 2021; To et al., 2019; Tsai, 2018; Zhai et al., 2022); technological applications (Lüthje, 2021; Ortega-Gras et al., 2021; Teixeira et al., 2022; Yu et al., 2021); yet researchers still need to explore the significant elements of green and digital transformation in the context of the fashion industry. Literature can be found on various topics and in different fields, such as the cement industry (Zhang et al., 2021), the automobile industry (Lüthje, 2021), the construction industry (Clarke & Sahin-Dikmen, 2020), small and medium-sized enterprises (Šimberová et al., 2022), the manufacturing industry (Sahu et al., 2022), the fashion industry (Brydges & Hracs, 2019; Sun et al., 2021); and several empirical as well as review studies with a variety of research frameworks (Feng et al., 2022; Kannan et al., 2022; Marsiglio & Privileggi, 2021; Wang et al., 2021; Zhai et al., 2022) that focus on policies, driving factors and challenges of green and digital transition. To the best of the researchers' knowledge, there is a minimal systematic literature review (SLR) concerning the elements of green and digital transition in the fashion industry. Therefore, the current study attempts to fill this knowledge gap by synthesising the factors of green and digital transitions in the fashion industry through a systematic literature review.

This literature review contributes in two ways. First, it compiles the rudiments of digital and ecological shifts in the fashion industry. Theoretically, this could help policymakers, practitioners, and stakeholders in the push for a green and digital economy. Second, identifying research gaps may have implications for future research, as new studies may be required to fill the gaps.

The remaining sections of this paper consist of four parts. The research methods section explains this study's methodology and guiding principles. The result section summarises the key findings of the fundamental factors supporting green and digital transformation in the fashion industry. The analysis of the results is presented in the discussion section. In the final section, the study highlights important directions for future research.

Research Methodology

Researchers employed a systematic literature review strategy to collect and analyse studies addressing the digital and ecological shifts in the fashion industry. A systematic literature review helps researchers understand and evaluate the current state of a topic so they can come to clear conclusions about it (Denyer & Tranfield, 2009). This paper presents the outcomes of a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 framework's recommended three-stage procedure(Kannan et al., 2022).

Literature identification

The authors of this study conducted a thorough literature search, shown in Table 1, for relevant articles published between 2012 and 2022. Since the first digital technologies were introduced to the industry in 2011(Bertola & Teunissen, 2018; Xu et al., 2021), researchers have focused on that period. This systematic literature review (SLR) was meticulously conducted following rigorous protocols, ensuring the reproducibility of the findings by other scholars. It can be updated with the latest findings on the critical factors of the fashion industry's transition to digital and green technologies. First, the research team decided on keywords and databases to use in their search for a relevant journal. Using the study's prime research question, the team selected the study's keyword set. The researchers used Scopus, Web of Science, ScienceDirect,

and Google Scholar databases. The search strategy was applied in the selected databases, and the employed keywords were "green transition" OR "digital transition" AND "fashion industry" OR "textile industry," resulting in 518 studies. The last search was made on March 18, 2023.

Table 1
The Steps to Finding Literature

Research Protocol	Description of details
Research databases	Scopus, Web of Science, ScienceDirect and Google Scholar
Other sources	Website and Organisation
Search box	Abstracts, titles, and keywords
Keyword used in search advanced search option	(("Green Transition" OR "Digital Transition") AND (" Fashion Industry" OR " Textile Industry"))

Source: Authors' analysis

A protocol with inclusion and exclusion criteria was made for this study. The research papers analysing green and digital technologies in the fashion supply chain to achieve a sustainable economy were considered for the study. The primary records comprise journal articles, proceeding papers, review articles, data papers, and early access. The researchers chose the studies pertinent to the analysis based on the criteria outlined in Table 2.

Table 2
Inclusion and Exclusion Criteria

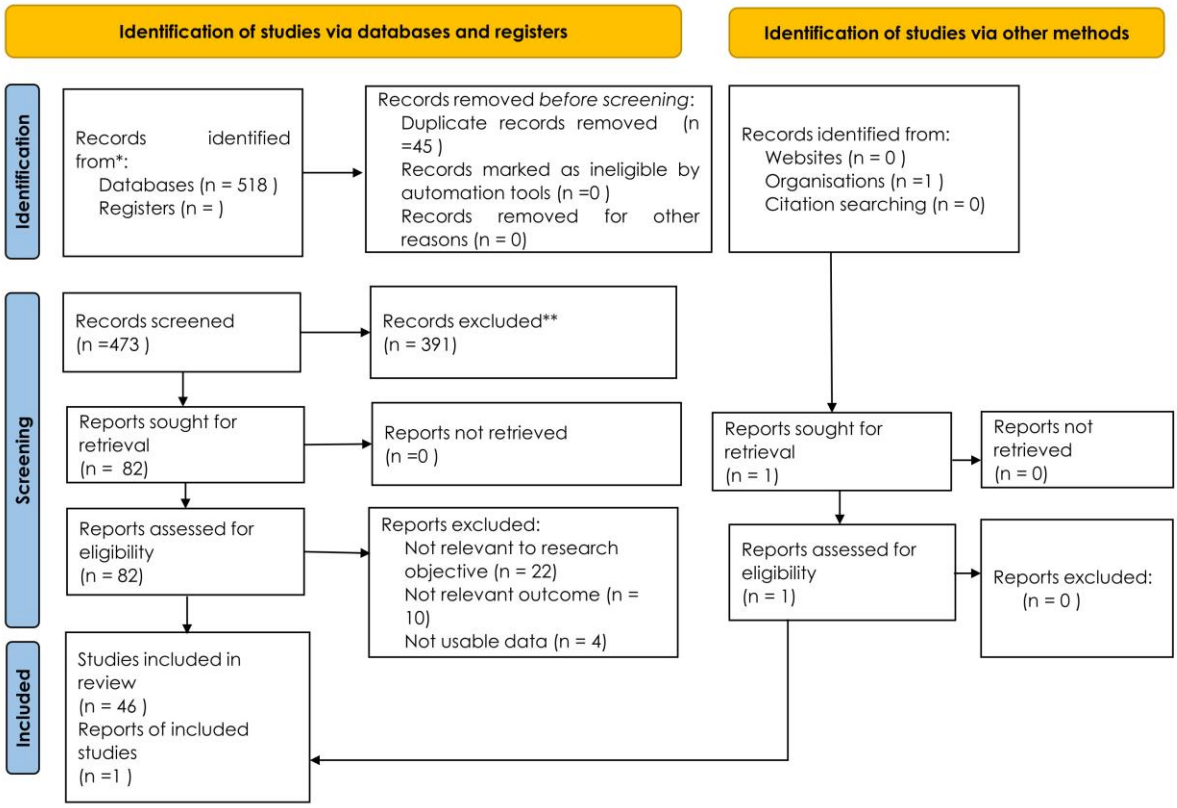
Criteria	Inclusion	Exclusion
Focus	Greening factors and digital technological shifts in textiles	Not related to the green and digital transition in fashion supply chain
Language	English	Other than English
Document Type	Only journal articles and review articles	Other than journal articles and review articles
Time frame	From January 2012 to December 2022	Out of the coverage from January 2012 to December 2022

Source: Authors' analysis

Literature evaluation

To filter out irrelevant articles, we used the method shown in Figure 3. Two researchers read the titles and abstracts of papers to determine if they were relevant to the research objective, and they eliminated 391 of the 473 records that were initially screened. According to this finding, the PRISMA framework's explicit research objective excluded about 82.67% of the records. Therefore, 82 records were chosen to retrieve and assess their suitability. There was also one organisation specifically targeted for retrieval and assessed for viability. The two authors talked over their contrasting opinions and settled on common ground. All studies under consideration reached a consensus.

Figure 3
Literature Review Method



Source: PRISMA 2020 model

Research analysis and interpretation

Researchers used a two-step process to screen and evaluate the studies to reduce the chance of bias. Firstly, greening factors and digital technological application-related literature in the fashion industry were imported into Microsoft Excel for descriptive analysis. The next step was to conduct an in-depth content analysis to map out key factors of green and digital fashions, summarise the state-of-the-art across various elements of greener and digital technological applications, and highlight pressing concerns and promising avenues for future study. At this point, all the information from the literature review has been gathered and written down. Descriptive and content analysis techniques were employed to present and discuss the study results.

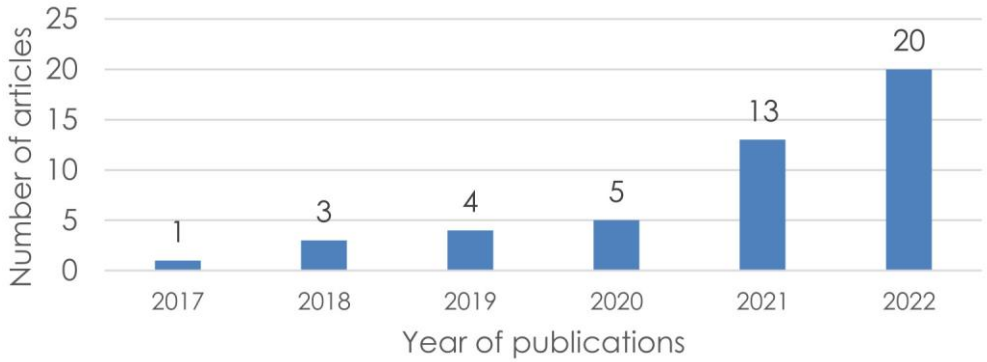
Result

This section presents the results of the systematic review of the crucial elements of the green and digital transition in the fashion industry.

Results from descriptive analysis

To develop a statistical overview of the development and structure of the body of knowledge on greening and digital technological shifting factors in the fashion industry, we sorted 46 reviewed papers according to year, journal, and country of origin.

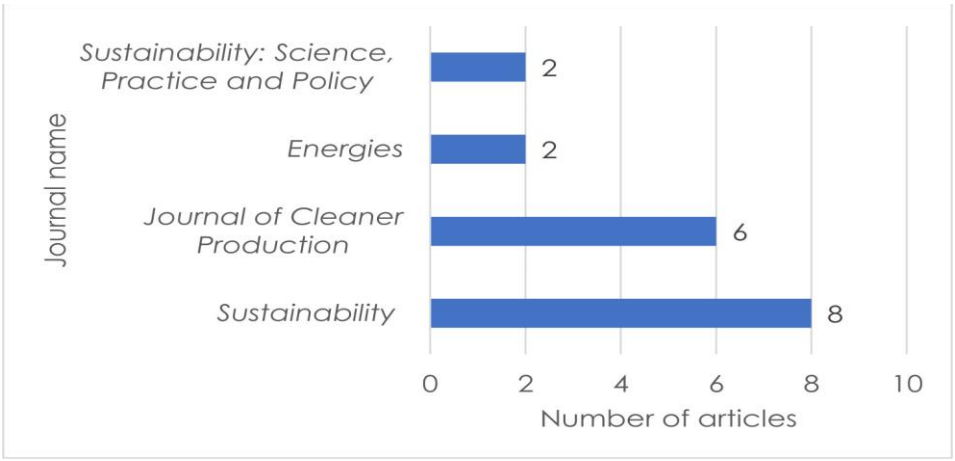
Figure 4
Publication Frequency over the Period



Source: Authors' analysis

Figure 4 shows the annual growth in publications discussing green and digital transitions in the textile and apparel industries from 2017 to 2022. Over the past five years, the percentage of annual publication growth has gone up. Specifically, 2017, 2018, 2019, 2020, 2021, and 2022 growth rates stand at 2.17%, 6.52%, 8.69%, 10.86%, 28.26%, and 43.47%, respectively. The goal was to find examples of how textile and apparel companies use digital and environmentally friendly technologies in the existing body of literature. The first study on green and digital transformational factors in the textile and apparel industry was published in 2017. This field's research grew steadily from 2021 to 2022, peaking in 2022. As shown in Figure 4, the fashion industry has focused primarily on green and digital transitional factors over the past two years. In 2022, there were 20 publications, representing almost half of the total publications during the publication years. The publication pattern reveals that researchers have been increasingly interested in studying the transition to more environmentally friendly and digital textiles in the last two years. However, progress in this area of study still needs to be improved.

Figure 5
Publication from Major Journal

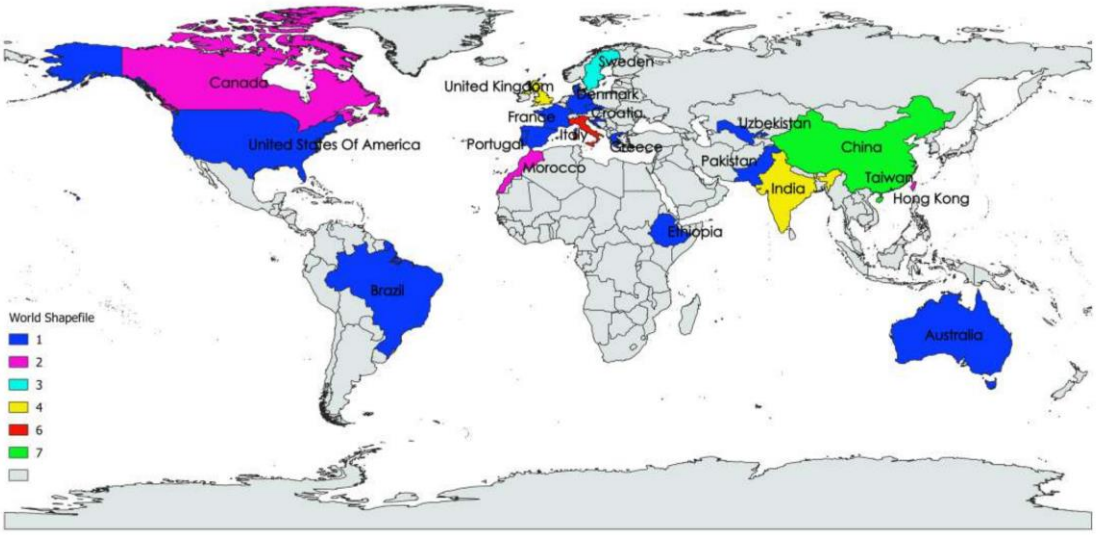


Source: Authors' analysis

Thirty-two journals have published the reviewed papers; Figure 5 presents a ranking of these journals, which have published more than one article. Sustainability, the

Journal of Cleaner Production, Energies, and Sustainability: Science, Practice, and Policy are just a few of the high-quality publications that have published numerous articles. Sustainability and the Journal of Cleaner Production host nearly a third of the reviewed papers.

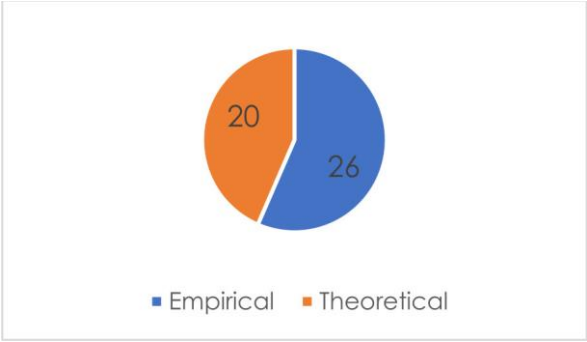
Figure 6
Publication from Different Countries



Source: Authors' analysis

From 2017 to 2022, authors from 23 nations penned works about green and digital transitions in the apparel business. Figure 6 displays the global scope of the reviewed literature by indicating the country of origin for each author. With seven studies, China led the world in publishing studies on using digital and environmentally friendly technologies in the fashion industry. The other considerable research contributions to the green and digital transition in the fashion industry came from Itali (6), the UK (4), India (4), Sweden (2), Morocco (2), Canada (2), Taiwan (2), and Hong Kong (2). The United States, France, Uzbekistan, Germany, Pakistan, Portugal, Denmark, Brazil, the Czech Republic, Ethiopia, Spain, Croatia, Australia, and Greece are just some of the other countries whose authors have contributed to the literature on the green and digital transition in the fashion industry.

Figure 7
Types of publications



Source: Authors' analysis

The data presented in Figure 7 illustrates the distribution of papers according to the types of publications, namely theoretical and empirical. Out of 46 studies, 26 are grounded in empirical research methodologies, encompassing quantitative, qualitative, mixed methods, and case study approaches. On the other hand, 20 papers adopt theoretical approaches, specifically review and conceptual frameworks.

Result from content analysis.

Table 3 and Table 4 below display the identified essential green transitional factors and digital transitional factors, respectively.

Table 3
Identified Essential Factors of Green Transitions.

Factors	Explanation	Reference
Sustainable materials	It refers to natural fibres such as organic cotton, hemp, and bamboo, which are biodegradable and grown using sustainable farming practices.	Sarkar et al.,(2020); Rosário & Dias (2022)
Cleaner production	Sustainable production, also called "cleaner production," is a system of processes, products, and services that work together to protect the environment and reduce risks to people and the environment.	Andaregie & Astatkie (2022); De Felice & Petrillo (2021); (Šajn, 2019)
R approach	The R approach stands for "Reduce, Reuse, and Recycle." It entails designing durable products, promoting second-hand fashion, and implementing recycling initiatives and closed-loop supply chains to reduce waste and conserve resources.	Sandvik & Stubbs (2019); Furferi et al., (2022); Mishra et al., (2020); Rosa et al., (2020)
Green product and process innovation	It refers to producing durable and recyclable or repurposable textiles and accessories.	Rosário & Dias (2022); Ikram (2022)
Waste management	It entails cutting down on waste from making and using garments.	Šajn (2019); Yu et al., (2021)
Green energy	Green energy refers to renewable energies such as solar, wind, water, and biomass, which contribute to reducing carbon emissions and other air pollutants associated with energy production. Methods such as optimising procedures and switching to renewable power sources fall under this category of energy conservation measures.	Li et al., (2019); Zamfir et al., (2022); Sarkar et al., (2020)
Green supply chain	It refers to creating and adopting environmentally friendly procedures throughout the supply chain, from the procurement of raw materials to the final disposition of the finished goods.	Coscieme et al., (2022); Li et al., (2019)
Sustainable consumption	It refers to promoting and encouraging consumer behaviour that reduces environmental and social harm by purchasing and using clothing and accessories. This method emphasises waste reduction, resource conservation, and safeguarding human rights through the educated purchase, use, and disposal of clothing and accessories.	Li et al., ((2019); Tsai (2018); Cai & Cho (2020)

Source: Authors' analysis

Table 4
Identified Essential Factors of Digital Transitions.

Factors	Explanation	Reference
Internet of Things (IoT)	It refers to integrating networked devices into manufacturing processes, as in the apparel industry.	Lüthje (2021); De Felice &Petrillo (2021); Ortega-Gras et al., (2021); Teixeira et al., (2022)
Artificial intelligence (AI)	It means using algorithms for computer vision, natural language processing, and machine learning to improve supply chain management, customer engagement, and product design, among other things.	Noor et al., (2022); Yu et al., (2021); Casciani et al., (2022); Ortega-Gras et al., (2021)
Robotics	It refers to designing, making, and using robots for industrial tasks like cutting, sewing, and putting things together. It enhances the efficiency of the fashion supply chain by introducing automation.	Bertola & Teunissen (2018); Rosário & Dias (2022)
3D printing	3D printing, also known as additive manufacturing, is a process whereby a digital model is used to create a physical object by adding layers of material.	Bertola & Teunissen (2018); Casciani et al., (2022)
Factors	Explanation	Reference
Blockchain	The blockchain is a transparent and trustworthy digital ledger that can record transactions. It helps monitor textiles throughout their entire lifecycle, from manufacturing to the final disposal.	Ikram (2022); Ortega-Gras et al., (2021)
Augmented reality (AR)	It describes a category of technologies integrating digital data and experiences into the physical world.	Ikram (2022); Sayem (2022); Casciani et al. (2022)
Social media	It is concerned with promoting fashion products and engaging with consumers.	Bailey et al., (2022); Ikram (2022); Zamfir et al., (2022)
Online shopping	It involves using the internet to buy and sell garments and related items.	Ikram (2022); Sayem (2022)

Source: Authors' analysis

The fashion industry is one of the largest polluters in the world, with significant impacts on water, energy, and land resources (Cai & Choi, 2020). In response, there has been an increasing focus on reducing the industry's environmental impact and promoting sustainable fashion. The industry is undergoing a green and digital transition to reduce its environmental impact and promote sustainability (Smouh et al., 2022; To et al., 2019). This transition involves integrating green initiatives and digital technologies into the production and consumption of fashion products.

The systematic literature review results reveal 46 articles, the most important of which identify the essential components of the green and digital transition in the fashion industry shown in Table 3 and suggest avenues for future research. The review of all 46 articles revealed eight green transitional factors, such as sustainable materials, green manufacturing, the circular economy, green product and process innovation, green energy, green building, a green supply chain, and waste

management, as well as eight digital transitional factors, such as the internet of things, robotics, and 3D printing in the fashion industry.

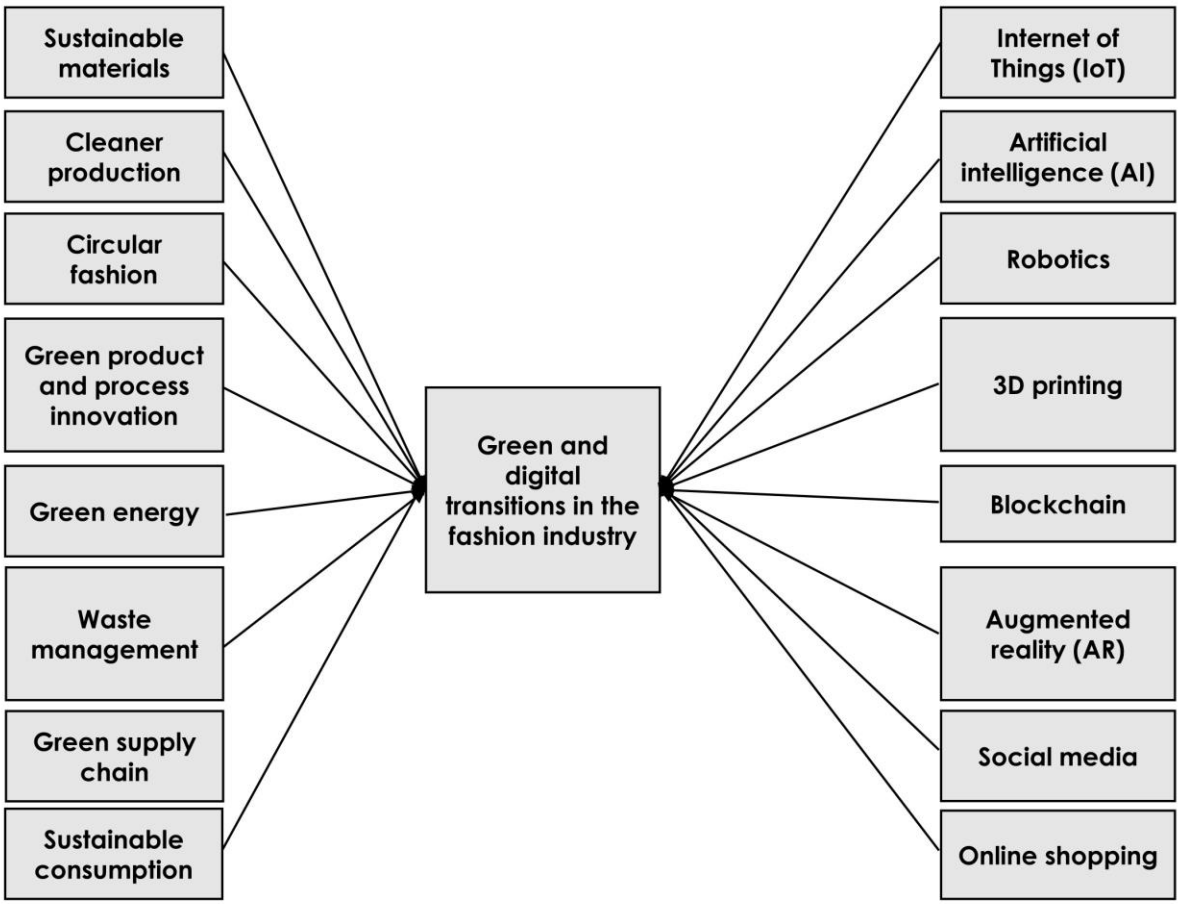
Discussion

The literature review addresses two specific research questions. This section discusses the two research questions presented in the introduction. The findings of this review revealed eight greening factors and eight digital technological applications essential to promoting sustainability in the textile supply chain. It is observed from the literature that the convergence of sustainability and technology has led to a symbiotic relationship between the green and digital transitions in the fashion industry. The fashion industry's future depends on adapting to the shift toward greening and digitisation. The use of technology to drive sustainability is central to both the green and digital transitions, whether it is blockchain to increase supply chain transparency or virtual reality to cut down on waste and enhance product design.

In the literature, every paper combines different parts of green and digital shifts in the fashion industry. Some parts are about making the textile supply chain greener, and others are about digital technologies. Sustainability in the fashion industry includes all phases of the garment life cycle, from raw material extraction to final disposal. Responsible consumption and post-consumer behaviour are also crucial to the fashion industry's supply chain transition to sustainable consumption. However, in light of the research questions, the results of this review can be discussed within a comprehensive factor framework of the green and digital transition, as shown in Figure 7.

85% of the raw materials used to make clothes are cotton and polyester, which are unsuitable for the environment. The fashion industry's greening relies heavily on eco-friendly materials (Sarkar et al., 2020). Sustainable raw materials suit the environment, society, and economy. They focus on protecting people and the planet from extraction to final disposal. Eco-friendly materials allow the fashion industry to reduce waste and produce longer-lasting goods. Some manufacturers may find it more challenging to switch to using sustainable materials due to their scarcity and the higher costs associated with their production (Ikram, 2022; Kannan et al., 2022; Rosário & Dias, 2022).

Figure 8
Green and Digital Fashion Transitions Factors Framework



Source: Authors' analysis

Reducing pollution, boosting energy efficiency, repurposing waste products, and improving waste management are the four cornerstones of sustainable production (Andaregie & Astatkie, 2022). Sustainable production incorporates renewable energy sources like solar and wind power to reduce environmental impact and increase productivity (De Felice & Petrillo, 2021; Madureira et al., 2022). Therefore, environmentally friendly manufacturing processes are necessary for the green fashion industry. A sustainable production process can help reduce the fashion industry's carbon footprint and improve the industry's sustainability (Šajn, 2019). Cleaner production implementation necessitates top-down support and executive guidance. Moreover, alterations to manufacturing procedures can halt ongoing production, wasting time and resources.

The implementation of a circular economy is crucial for the development of green textiles (Sandvik & Stubbs, 2019). The R approach reduces waste and saves resources by establishing a closed-loop system in which products are recycled, reused, or repurposed at the end of their useful lives (Mishra et al., 2020; Sahu et al., 2022). The fashion industry can benefit from this because it can aid in reducing waste and enhancing sustainability (Rosa et al., 2020). However, transitioning from a linear to a circular economy can be difficult because of insufficient supporting infrastructure, standardised procedures, and regulations.

Green product and process design entails making sustainable clothing and accessories for the environment, society, and the bottom line (Andaregie & Astatkie,

2022; Rosário & Dias, 2022). Green product and process initiatives are reshaping the pattern of the textile industry. By focusing on eco-friendly materials, reducing waste, and creating durable, recyclable, and adaptable products, this approach aims to reduce the fashion industry's negative impact on the environment and society (Ikram, 2022).

Green energy is an excellent option for the entire fashion industry, from raw material production to final product distribution. Factories that switch to renewable energy sources can reduce their reliance on fossil fuels, their monthly energy costs, and their adverse environmental effects, among other benefits. In addition, the fashion business can use renewable energy to power the trucks and ships that move their products from one place to another. This can drastically cut carbon emissions, a significant factor in global warming (Feng et al., 2022; Li et al., 2019; Sarkar et al., 2020).

Waste management ensures that all kinds of solid and liquid trash are collected, sorted, and thrown away correctly. The increasing amount of waste produced and its detrimental environmental impacts have become a significant concern for worldwide authorities. The textile and clothing industries' waste management and sustainability challenges have received a significant boost in the age of climate catastrophe (Šajn, 2019; Yu et al., 2021). An effluent treatment plant (ETP) is a system for managing waste that cleans water used in manufacturing and other industrial processes. The purpose of ETP is to clean wastewater of harmful pollutants so that it can be safely released into the environment or reused. ETPs usually use a mix of physical, chemical, and biological processes, such as sedimentation, aeration, and filtration, to clean up wastewater (Shamsi et al., 2022; To et al., 2019).

The green fashion industry demands a green supply chain (Coscieme et al., 2022; Desore & Narula, 2018; Li et al., 2019). Each step in the green supply chain, from production to distribution, contributes to the final product's value to the consumer. Partners in green supply chains cooperate to lessen the environmental impact of industrial processes by recycling more and disposing of less hazardous waste (Andaregie & Astatkie, 2022; Cai & Choi, 2020). Supply chains in the fashion industry are notoriously difficult for businesses to penetrate, making it tough to verify the legitimacy of their raw materials and implement ethical, environmentally friendly manufacturing processes.

Sustainable consumption can be seen in the fashion industry through eco-friendly laundry practices. Consumers can make their clothes less harmful to the environment by washing them less often, washing them in cold water with eco-friendly detergents, and letting them dry in the air instead of using a dryer, which saves energy and extends the life of clothing. Therefore, consumers' habits must shift before sustainable and digital technologies can be widely adopted, and this transition can be slow and unpredictable (Khurana, 2022; Mishra et al., 2020). Sustainable products are often disregarded because consumers are unaware of the fashion industry's adverse effects on the environment and society. Because of this, sustainable production practices may be costly for businesses. In a society where fast fashion and frequent trend shifts are the norms, it can be challenging to persuade consumers to change their consumption habits to be more sustainable and circular (Bailey et al., 2022).

IoT devices can monitor and control various aspects of the manufacturing process, such as energy consumption, resource utilisation, and product quality, to achieve industrial efficiency (De Felice & Petrillo, 2021). Besides, IoT enables fashion companies to collect and analyse real-time data from connected devices, such as smart clothing and accessories (Teixeira et al., 2022). This data can be used to improve sustainability by reducing waste and increasing efficiency. IoT can also help companies improve

customer experiences by providing real-time product information like location and usage (Šimberová et al., 2022).

AI plays a crucial role in the digital transition of the fashion industry by enabling companies to make data-driven decisions, optimise operations, and improve customer experiences (Noor et al., 2022). For example, AI algorithms can analyse consumer data, such as purchase history and social media activity, to help companies better understand their customers' preferences and make more informed decisions about product design and marketing (Yu et al., 2021).

Incorporating robotics into the fashion industry's digitisation process is crucial (Bertola & Teunissen, 2018). It allows businesses to eliminate mundane and potentially dangerous tasks, freeing human resources to focus on those requiring exceptional skill and creativity (Rosário & Dias, 2022). By automating the movement of goods, lowering the need for human intervention, and minimising the possibility of injury, robotics enhances the effectiveness of supply chains (Ortega-Gras et al., 2021).

The fashion industry can save time and money creating physical samples because rapid prototyping with 3D printing technology has made that practice obsolete (Bertola & Teunissen, 2018; Casciani et al., 2022; Papahristou & Bilalis, 2017). 3D printing also allows for the creation of unique and customisable products, giving fashion companies a competitive edge in the market.

Blockchain technology can transform the fashion industry by creating greater transparency, accountability, and sustainability in the supply chain. The entire textile production and disposal process can be tracked in an open and trustworthy manner with the help of blockchain technology (Ikram, 2022; Ortega-Gras et al., 2021). The use of blockchain technology in the apparel industry has the potential to boost its reliability, productivity, and social and environmental impact. The potential for illegal dumping and environmental pollution caused by textile waste can be mitigated if this is done. However, security and privacy are two areas where blockchain can be problematic (Sayem, 2022).

The fashion industry stands to benefit significantly from the revolutionary potential of virtual reality (VR) and augmented reality (AR) (Ikram, 2022). VR transports the user to a simulated setting, while AR enhances the real world with digital data. Both virtual and augmented reality present the fashion industry with promising new ways to improve the shopping experience for its customers and find solutions to some of its most pressing problems (Sayem, 2022).

Digital disruptive technology, such as online shopping, has dramatically altered the apparel business (Bertola & Teunissen, 2018). It has made it easier and more accessible for people to buy clothing, footwear, and accessories while also expanding the market for fashion companies. For instance, Zara's e-commerce platform includes free shipping and returns, personalised products, and online exclusives (Sayem, 2022).

Social media platforms have revolutionised the fashion industry by introducing new channels for consumer interaction, brand promotion, and online sales (Bailey et al., 2022; Zamfir et al., 2022). They have become crucial tools for the fashion industry to remain competitive in the digital age.

However, there are also significant difficulties that the green and digital transition presents for the fashion industry, such as juggling the demands of fast fashion and sustainability or managing data privacy and security in an increasingly digital ecosystem. To successfully navigate these obstacles, fashion companies must cultivate new skills, capabilities, and partnerships that allow them to innovate and adapt to shifting market dynamics. The fashion industry's transition to a greener and more digital future is a massive undertaking with numerous moving parts that must be

carefully planned and executed. By leveraging sustainable practices and digital technologies, fashion companies can increase their competitiveness, enhance their brand image, and drive innovation and expansion in a market that is becoming increasingly complex and dynamic. In short, Table 3 addresses the research questions posed by this systematic literature review.

Conclusion

The study's primary objective was to determine what elements are most important in the green and digital transition in the fashion industry. This systematic review has synthesised diverse literature on the essential elements of green and digital transitions in the fashion industry. Reviewing previous studies has identified green practices, such as eco-friendly materials, green manufacturing, a green supply chain, a circular economy model, and reducing waste, that can help reduce the fashion industry's negative environmental and social impact and increase the profitability and competitiveness of fashion companies. In addition, the study uncovered the presence of digital technologies like AI, the IoT, and robotics in the fashion supply chain to optimise production efficiency, decrease costs, and raise product quality. Therefore, green and digital transitions in the fashion supply chain can promote sustainability by enhancing image and income capacity and lowering costs and pollution. The study results are helpful for managers and academicians in advancing their understanding of green and digital textiles. As part of the overall green and digital transformation, the fashion manufacturing industry must adopt sustainable practices and digital technologies across the entire value chain. Implementing these systems boosts productivity, reduces waste, and reduces environmental pollution. However, they must also overcome the challenges posed by high investment costs, the need for a skilled workforce, and the requirement for significant organisational changes. The first limitation of this study is the selection of keywords used in the literature search. While the search terms employed in the study cover a significant portion of the study field, they can be broader. By incorporating additional keywords such as "apparel industry" and "transformation" into the search terms, future research could enhance the search's comprehensiveness. This study considered only articles and review papers; therefore, books and conference papers still need to be included.

The review identifies eight significant research gaps with theoretical and practical implications. Since the fashion industry has such harmful environmental effects, researchers can concentrate on green and digital transitions. Digital technology and eco-friendly clothing are other areas where they can pursue the investigation. Professionals can use these gaps to plan future research and dive deeper into green and digital technology adoption. First, green and digital transitions are indispensable to addressing the industry's environmental, social, and economic challenges. The convergence of green and digital technologies can boost a business's environmental friendliness, economic viability, social conscience, innovative capacity, and public image. Still, studies have yet to be found in the leather and pharmaceutical sectors. These industries also deal with intricate supply chains and sustainability. Therefore, future research could be considered in the context of green and digital transformations in these industries. Second, empirical research combining expert opinion and survey data on green practices and digital innovation at the enterprise level may be used in future studies, which needs to be included in the current study. Third, since most textiles are produced in developing or least-developed countries, they appear to be more susceptible to the adverse effects of the fashion industry. The environmental benefits of the "twin" transition need to be properly quantified and qualified; therefore, additional study is needed in these areas. Fourth, digital and

green transitions are crucial for attaining net zero emissions, but implementing these transitions is challenging. Thus, future studies could consider critical failure factors of green and digital growth in the fashion industry. Fifth, the present study has yet to provide a green and digital technology assessment framework; future studies could propose such a model to assist in measuring the integration of green and digital technologies in the fashion industry. Sixth, studies can be conducted that compare the green economy in the fashion industry in developed and emerging markets at different stages of development. Seventh, the effects of the fashion industry's green and digital shifts on society are underexplored, but they significantly impact the fashion business and society. Finally, studies concerning the effectiveness of specific digital technologies in improving sustainability and efficiency in the fashion industry, such as blockchain for supply chain management, 3D printing for production, and virtual reality for retail, still need to be included.

References

1. Andaregie, A., & Astatkie, T. (2022). Determinants of the adoption of green manufacturing practices by medium- and large-scale manufacturing industries in northern Ethiopia. *African Journal of Science, Technology, Innovation and Development*, *14*(4), 960–975. https://doi.org/10.1080/20421338.2021.1921898
2. Bag, S., Yadav, G., Dhamija, P., & Kataria, K. K. (2021). Key resources for industry 4.0 adoption and its effect on sustainable production and circular economy: An empirical study. *Journal of Cleaner Production*, *281*, 125233. https://doi.org/10.1016/J.JCLEPRO.2020.125233
3. Bailey, K., Basu, A. , Bailey, K., Basu, A., & Sharma, S. (2022). The Environmental Impacts of Fast Fashion on Water Quality: A Systematic Review. *Water, 14*(7), 1073. https://doi.org/10.3390/w14071073
4. Bertola, P., & Teunissen, J. (2018). Fashion 4.0. Innovating fashion industry through digital transformation. *Research Journal of Textile and Apparel*, *22*(4), 352–369. https://doi.org/10.1108/RJTA-03-2018-0023
5. Bianchini, S., Damioli, G., & Ghisetti, C. (2022). The environmental effects of the "twin" green and digital transition in European regions. *Environmental and Resource Economics*, *84*(4), 877–918. https://doi.org/10.1007/S10640-022-00741-7/TABLES/8
6. Brydges, T. (2021). Closing the loop on take, make, waste: Investigating circular economy practices in the Swedish fashion industry. *Journal of Cleaner Production*, *293*, 126245. https://doi.org/10.1016/j.jclepro.2021.126245
7. Brydges, T., & Hracs, B. J. (2019). What motivates millennials? How intersectionality shapes the working lives of female entrepreneurs in Canada's fashion industry. *Gender, Place and Culture*, *26*(4), 510–532. https://doi.org/10.1080/0966369X.2018.1552558
8. Cai, Y. J., & Choi, T. M. (2020). A United Nations' Sustainable Development Goals perspective for sustainable textile and apparel supply chain management. *Transportation Research Part E: Logistics and Transportation Review*, *141*(May), 102010. https://doi.org/10.1016/j.tre.2020.102010
9. Casciani, D., Chkanikova, O., & Pal, R. (2022). Exploring the nature of digital transformation in the fashion industry: opportunities for supply chains, business models, and sustainability-oriented innovations. *Sustainability: Science, Practice, and Policy*, *18*(1), 773–795. https://doi.org/10.1080/15487733.2022.2125640
10. Clarke, L., & Sahin-Dikmen, M. (2020). Unions and the green transition in construction in Europe: Contrasting visions. *European Journal of Industrial Relations*, *26*(4), 401–418. https://doi.org/10.1177/0959680120951705
11. Coscieme, L., Manshoven, S., Gillabel, J., Grossi, F., & Mortensen, L. F. (2022). A framework of circular business models for fashion and textiles: the role of business-model, technical, and social innovation. *Taylor & Francis*, *18*(1), 451–462. https://doi.org/10.1080/15487733.2022.2083792

12. De Felice, F., & Petrillo, A. (2021). Green transition: The frontier of the digicircular economy evidenced from a systematic literature review. *Sustainability*, *13*(19), 11068. https://doi.org/10.3390/su131911068
13. Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In D. A. Buchanan & A. Bryman (Eds.), *The Sage handbook of organisational research methods* (pp. 671–689). Sage Publications Ltd.
14. Desore, A., & Narula, S. A. (2018). An overview on corporate response towards sustainability issues in textile industry. *Environment, Development and Sustainability*, *20*(4), 1439–1459. https://doi.org/10.1007/s10668-017-9949-1
15. Ellen MacArthur Foundation. (2017). *A New Textiles Economy: Redesigning Fashion's Future*. https://ellenmacarthurfoundation.org/a-new-textiles-economy
16. Feng, C. C., Chang, K. F., Lin, J. X., Lee, T. C., & Lin, S. M. (2022). Toward green transition in the post Paris Agreement era: the case of Taiwan. *Energy Policy*, 165, 112996. https://doi.org/10.1016/j.enpol.2022.112996
17. Furferi, R., Volpe, Y., & Mantellassi, F. (2022). Circular Economy Guidelines for the Textile Industry. *Sustainability (Switzerland)*, *14*(17), 11111. https://doi.org/10.3390/su141711111
18. Furjan, M. T., Tomičić-Pupek, K., & Pihir, I. (2020). Understanding digital transformation initiatives: Case studies analysis. *Business Systems Research: International Journal of the Society for Advancing Innovation and Research in Economy*, *11*(1), 125–141. https://doi.org/10.2478/bsrj-2020-0009
19. Hiller Connell, K. Y., & Kozar, J. M. (2017). Introduction to special issue on sustainability and the triple bottom line within the global clothing and textiles industry. *Fashion and Textiles*, *4*(1), 0–2. https://doi.org/10.1186/s40691-017-0100-6
20. Ikram, M. (2022). Transition toward green economy: Technological Innovation's role in the fashion industry. *Current Opinion in Green and Sustainable Chemistry*, *37*, 100657. https://doi.org/10.1016/J.COGSC.2022.100657
21. Kannan, D., Shankar, K. M., & Gholipour, P. (2022). Paving the way for a green transition through mitigation of green manufacturing challenges: A systematic literature review. *Journal of Cleaner Production*, *368*(May), 132578. https://doi.org/10.1016/j.jclepro.2022.132578
22. Kazancoglu, I., Kazancoglu, Y., Yarimoglu, E., & Kahraman, A. (2020). A conceptual framework for barriers of circular supply chains for sustainability in the textile industry. *Sustainable Development*, *28*(5), 1477–1492. https://doi.org/https://doi.org/10.1002/sd.2100
23. Khurana, K. (2022). The Indian fashion and textile sector in and post COVID-19 times. *Fashion and Textiles*, *9*(15), 1–16. https://doi.org/10.1186/s40691-021-00267-4
24. Li, J., Wei, W., Zhen, W., Guo, Y., & Chen, B. (2019). How Green Transition of Energy System Impacts China's Mercury Emissions. *Earth's Future*, *7*(12), 1407–1416. https://doi.org/10.1029/2019EF001269
25. Lüthje, B. (2021). Going digital, going green: Changing production networks in the automotive industry in China. *International Journal of Automotive Technology and Management*, *21*(1–2), 121–136. https://doi.org/10.1504/IJATM.2021.113355
26. Rosário, A. T., & Dias, J. C. (2022). Sustainability and the digital transition: A literature review. *Sustainability*, 14(7), 4072. https://doi.org/10.3390/SU14074072
27. Majumdar, A., Shaw, M., & Sinha, S. K. (2020). COVID-19 debunks the myth of socially sustainable supply chain: A case of the clothing industry in South Asian countries. *Sustainable Production and Consumption*, *24*, 150–155. https://doi.org/10.1016/J.SPC.2020.07.001
28. Marsiglio, S., & Privileggi, F. (2021). Three dimensional fractal attractors in a green transition economic growth model. *Communications in Nonlinear Science and Numerical Simulation*, *93*, 105509. https://doi.org/10.1016/j.cnsns.2020.105509
29. Michel, G. M., & Lee, Y. A. (2017). Cloth(ing) for the dead: case study of three designers' green burial practices. *Fashion and Textiles*, *4*(1). https://doi.org/10.1186/S40691-017-0088-Y

30. Mishra, S., Jain, S., & Malhotra, G. (2020). The anatomy of circular economy transition in the fashion industry. *Social Responsibility Journal*, *17*(4), 524–542. https://doi.org/10.1108/SRJ-06-2019-0216
31. Nayak, R., Panwar, T., & Van Thang Nguyen, L. (2020). Sustainability in fashion and textiles: A survey from developing country. *Sustainable Technologies for Fashion and Textiles*, *2020,* 3–30. https://doi.org/10.1016/B978-0-08-102867-4.00001-3
32. Noor, A., Saeed, M. A., Ullah, T., Uddin, Z., & Ullah Khan, R. M. W. (2022). A review of artificial intelligence applications in apparel industry. *Journal of the Textile Institute*, *113*(3), 505–514. https://doi.org/10.1080/00405000.2021.1880088
33. Nyangchak, N. (2022). Emerging green industry toward net-zero economy: A systematic review. *Journal of Cleaner Production*, *378*(July), 134622. https://doi.org/10.1016/j.jclepro.2022.134622
34. O'Reilly, S., & Kumar, A. (2016). Closing the loop: An exploratory study of reverse ready-made garment supply chains in Delhi NCR. *International Journal of Logistics Management*, *27*(2), 486–510. https://doi.org/10.1108/IJLM-03-2015-0050
35. Ortega-Gras, J. J., Bueno-Delgado, M. V., Cañavate-Cruzado, G., & Garrido-Lova, J. (2021). Twin Transition through the Implementation of Industry 4.0 Technologies: Desk-Research Analysis and Practical Use Cases in Europe. *Sustainability, 13*(24), 13601. https://doi.org/10.3390/SU132413601
36. Papahristou, E., & Bilalis, N. (2017). Should the fashion industry confront the sustainability challenge with 3D prototyping technology. *International Journal of Sustainable Engineering*, *10*(4–5), 207–214. https://doi.org/10.1080/19397038.2017.1348563
37. Peters, G., Li, M., & Lenzen, M. (2021). The need to decelerate fast fashion in a hot climate - A global sustainability perspective on the garment industry. *Journal of Cleaner Production*, *295*, 126390. https://doi.org/10.1016/J.JCLEPRO.2021.126390
38. Presley, A., & Meade, L. M. (2018). The Business Case for Sustainability: An Application to Slow Fashion Supply Chains. *IEEE Engineering Management Review*, *46*(2), 138–150. https://doi.org/10.1109/EMR.2018.2835458
39. Rosa, P., Sassanelli, C., Urbinati, A., Chiaroni, D., & Terzi, S. (2020). Assessing relations between Circular Economy and Industry 4.0: a systematic literature review. *International Journal of Production Research*, *58*(6), 1662–1687. https://doi.org/10.1080/00207543.2019.1680896
40. Rosário, A. T., & Dias, J. C. (2022). Sustainability and the Digital Transition: A Literature Review. *Sustainability (Switzerland)*, *14*(7), 1–18. https://doi.org/10.3390/su14074072
41. Sahu, A., Agrawal, S., & Kumar, G. (2022). Integrating Industry 4.0 and circular economy: a review. *Journal of Enterprise Information Management*, *35*(3), 885–917. https://doi.org/10.1108/JEIM-11-2020-0465
42. Šajn, N. (2019). Environmental impact of the textile and clothing industry. What consumers need to know. *European Parliamentary Research Service*, *January*. https://www.europarl.europa.eu/portal/en
43. Sandvik, I. M., & Stubbs, W. (2019). Circular fashion supply chain through textile-to-textile recycling. *Journal of Fashion Marketing and Management*, *23*(3), 366–381. https://doi.org/10.1108/JFMM-04-2018-0058
44. Sarkar, A., Qian, L., & Peau, A. K. (2020). Overview of green business practices within the Bangladeshi RMG industry: competitiveness and sustainable development perspective. *Environmental Science and Pollution Research*, *27*(18), 22888–22901. https://doi.org/10.1007/S11356-020-08816-Y/FIGURES/2
45. Sayem, A. S. M. (2022). Digital fashion innovations for the real world and metaverse. *International Journal of Fashion Design, Technology and Education, 15*(2), 139-141. https://doi.org/10.1080/17543266.2022.2071139
46. Shamsi, M. A., Chaudhary, A., Anwar, I., Dasgupta, R., & Sharma, S. (2022). Nexus between Environmental Consciousness and Consumers' Purchase Intention toward Circular Textile Products in India: A Moderated-Mediation Approach. *Sustainability*, *14*(20), 12953. https://doi.org/10.3390/su142012953
47. Šimberová, I., Korauš, A., Schüller, D., Smolíkova, L., Straková, J., & Váchal, J. (2022). Threats and Opportunities in Digital Transformation in SMEs from the Perspective of

Sustainability: A Case Study in the Czech Republic. *Sustainability, 14*(6), 3628. https://doi.org/10.3390/su14063628
48. Smouh, S., Gargab, F. Z., Ouhammou, B., Mana, A. A., Saadani, R., & Jamil, A. (2022). A New Approach to Energy Transition in Morocco for Low Carbon and Sustainable Industry (Case of Textile Sector). *Energies*, *15*(10), 3693. https://doi.org/10.3390/EN15103693
49. Sun, X., Wang, X., Sun, F., Tian, M., Qu, L., Perry, P., Owens, H., & Liu, X. (2021). Textile Waste Fiber Regeneration via a Green Chemistry Approach: A Molecular Strategy for Sustainable Fashion. *Advanced Materials*, *33*(48). https://doi.org/10.1002/adma.202105174
50. Teixeira, E. L. S., Tjahjono, B., Beltran, M., & Julião, J. (2022). Demystifying the digital transition of remanufacturing: A systematic review of literature. *Computers in Industry*, *134*, 103567. https://doi.org/10.1016/j.compind.2021.103567
51. To, M. H., Uisan, K., Ok, Y. S., Pleissner, D., & Lin, C. S. K. (2019). Recent trends in green and sustainable chemistry: rethinking textile waste in a circular economy. *Current Opinion in Green and Sustainable Chemistry*, *20*, 1–10. https://doi.org/10.1016/J.COGSC.2019.06.002
52. Tsai, W. H. (2018). Green production planning and control for the textile industry by using mathematical programming and industry 4.0 techniques. *Energies*, *11*(8). https://doi.org/10.3390/en11082072
53. Wang, C., Li, X. wu, Wen, H. xing, & Nie, P. yan. (2021). Order financing for promoting green transition. *Journal of Cleaner Production*, *283,* 125415. https://doi.org/10.1016/j.jclepro.2020.125415
54. Wynn, M., & Jones, P. (2022). Digital Technology Deployment and the Circular Economy. *Sustainability (Switzerland)*, *14*(15), 9077. https://doi.org/10.3390/SU14159077/S1
55. Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). Industry 4.0 and Industry 5.0—Inception, conception and perception. *Journal of Manufacturing Systems*, *61*, 530–535. https://doi.org/10.1016/J.JMSY.2021.10.006
56. Yu, Y., Zhang, J. Z., Cao, Y., & Kazancoglu, Y. (2021). Intelligent transformation of the manufacturing industry for Industry 4.0: Seizing financial benefits from supply chain relationship capital through enterprise green management. *Technological Forecasting and Social Change*, *172*, 120999. https://doi.org/10.1016/J.TECHFORE.2021.120999
57. Smouh, S., Gargab, F. Z., Ouhammou, B., Mana, A. A., Saadani, R., & Jamil, A. (2022). A new approach to energy transition in Morocco for low carbon and sustainable industry (case of textile sector). *Energies, 15*(10), 3693. https://doi.org/10.3390/en15103693
58. Zhai, X., An, Y., Shi, X., & Liu, X. (2022). Measurement of green transition and its driving factors: Evidence from China. *Journal of Cleaner Production*, *335*, 130292. https://doi.org/10.1016/j.jclepro.2021.130292
59. Zhang, C.-Y. Y., Yu, B., Chen, J. M., & Wei, Y. M. (2021). Green transition pathways for cement industry in China. *Resources, Conservation and Recycling*, *166*, 105355. https://doi.org/10.1016/j.resconrec.2020.105355

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