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EXPLORING ANTECEDENTS OF SUSTAINABLE PERFORMANCE IN FASHION INDUSTRY, USING A SYSTEMATIC LITERATURE REVIEW APPROACH

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Abstract:

The fashion industry as one of the largest sectors globally, is among the most resource-consuming in the world regarding environmental impact. The fashion firms consist of the different phases of design and production, the activities which are not mostly eco-friendly. On another side, the growing demand for sustainability in this industry has provoked a move in the way firms approach their activities. In the recent past, different changes have been observed in design and production for an improved environmental and social performance to achieve sustainability goals. Hence, with the purpose of exploring and reviewing the available research on sustainable performance and green practices, this study used a systematic literature review protocol. Applying narrative synthesis method and using the Web of Sciences and Scopus databases, it analysed the latest literature from 2014 to 2024 to assess the significant role fashion designers play to drive sustainability trends within the fashion industry. By exploring key concepts such as green practices and the integration of technologies, this paper identified how these approaches contribute to social, economic, and environmental sustainability. The review combined existing studies, highlighting key trends, and factors that fashion designers employ in integrating sustainability into their work, offering insights for future research.

Keywords:

Digital Technology, Green Practices, Sustainability

Introduction

The fashion industry is widely recognized for its significant environmental and social impacts, ranging from resource-intensive production processes to the generation of huge amounts of waste (Niinimäki, 2020; Singh & Bansal, 2024). Globally, the fashion sector produces over 92 million tonnes of textile waste annually, and is responsible for 11% of global plastic waste, with only eight per cent of textiles fibres in 2024 made from recycled source. While for a single cotton t-shirt to be degraded, it takes around six years (Khan, 2024). The "fast fashion" model makes these challenges worse by promoting overconsumption and waste; as, it categorized by rapid production cycles and disposable garments. In addition, based on the reports, average number of times a garment is worn before being discarded has decreased by 36% in the last 15 year (Srinivasan, 2025). On another side, the global fashion industry has undergone a significant transformation and increasing pressure to address the environmental and social impacts. Hence, Sustainability has become a critical focus area, driven by eco-friendly concerns, consumer demand, and regulatory concentration (Bertola & Colombi, 2024). Hence, with increasing demands from consumers, governments, and industry bodies, in response to these concerns, fashion firms are increasingly looking for ways to adopt sustainable practices to decrease their environmental wastes and improve long-term capability that address the dimensions of sustainability (Abbate, Centobelli & Cerchione, 2023; Huang & Xiao, 2023; Thorisdottir et al., 2024).

Sustainable performance can be analyzed through three key dimensions including environmental, social, and economic; every dimension addresses different concerns (de Souza Barbosa et al., 2023). Environmental performance refers to minimizing negative environmental impacts, such as pollution, excessive water use, and carbon emissions. Social performance includes improving labor conditions, promoting fair wages, and ensuring ethical sourcing (Govindan, Kaliyan, Kannan & Haq, 2025). And Economic performance involves maintaining profitability while ensuring that sustainability initiatives do not burden businesses excessively (Sarfraz, Ozturk, Yoo, Raza & Han, 2023; Jindal, 2025). Sustainability in the fashion industry includes a wide range of practices target to reduce environmental impact, promote ethical labor practices, and ensure economic viability for all stakeholders. The key components of sustainable fashion include the use of eco-friendly materials, waste reduction, ethical manufacturing, and sustainable supply chains (Adamkiewicz et al., 2022; Vangeri et al., 2024; Cuong, Thai, Rocha & Nguyen, 2025; Greeshma, Sadhna & Kumar, 2025).

Fashion designers are at the forefront of balancing dimensions of sustainability. As key decision-makers in the design and product development process, they are uniquely positioned to drive sustainable efforts by their design choices, material selections, production techniques, aesthetic choices and integration of technology that align with sustainable principles (Islam, Perry & Gill, 2021; Gornostaeva, 2023; Yuan et al., 2025). Applying green practices, such as the use of eco-friendly materials and waste reduction techniques allow designers to minimize the environmental impacts of their work. On the other hand, digital technologies such as 3D printing, digital fabric creation, and virtual design tools have developed designers' sustainable practices in the fashion industry, providing new opportunities for resource efficiency and reducing waste (Mandarić, Hunjet & Vuković, 2022; Habib, Ullah & Maha, 2025). Integrating of green practices and technology, fashion designers can have a cooperative effect on the sustainable performance of fashion firms. When combined, these approaches can also help fashion brands achieve higher levels of financial performance creating a competitive advantage

in an ever more eco-conscious market (Li, Chow, Choi & Chan, 2016; Lim, Hye-Won & Cassidy, Tracy, 2024; Ma, Huang, Guo & Zhu, 2024; Zoupanou & Banerjee, 2025).

Despite the growing concern to sustainability in the fashion industry, many studies have assessed sustainable practices from a supply chain or corporate strategy aspects (Imran, et al., 2024; Bogdan & Matica, 2025), and less emphasis has been placed on the role of fashion designers as the important players who directly influence material selection, product design, and technology adoption. While it is significant to explore designers' roles as key agents of change, capable of driving sustainability outcomes (Li, Li, Song & Fan, 2021). Furthermore, different green practices have been identified as important tools to improve sustainable performance. Based on the evidence of previous studies, research on sustainable performance in the fashion industry remains uneven; these inconsistencies make it difficult to make a clear, unified understanding of the designers' role in promoting sustainability (Ma et al. 2024). Thus, it required to do more exploration on different definitions, theories, and contexts. This systematic literature review (SLR) is significant to address this gap, as it allows for a comprehensive and unbiased synthesis of existing research, by identifying patterns and knowledge gaps in the current literature. Through gathering information of different studies on the role of fashion designers on sustainable performance, this review targets to provide a clear conceptual outline to integrate the findings and contribute to the theoretical discussions of sustainability that enhance the sustainable performance of fashion firms.

Literature Review
Fashion industry is transferring toward more eco-friendly activities; central to this transformation are fashion designers, who play an important role to shape the sustainable performance of fashion firms (Kozlowski, Bardecki & Searcy, 2019; (Chen, Qie, Memon & Yesuf, 2021; Ma et al., 2024; Rana, 2024). By influencing every aspect of the design and production process, their creative decisions can significantly affect sustainable practices. According to Pollini and Rognoli (2021), choosing innovative design method, they can also affect the lifecycle of products from material selection to production processes and end-of-life disposal. Gwilt (2020) suggested that the green practice of designers is a comprehensive approach which aligns with the triple bottom line (TBL) of sustainability across the total product life cycle. Hence, designers' role is not just about aesthetics; as, they can drive the industry answer to environmental challenges using their design choices (Padhi, 2018; Alahira et al., 2024; Nigatu, Degoma & Tsegaye, 2024; Maieli, 2025). Applying innovative preference, designers are able to affect producing and consuming green fashion products, which can make them as key drivers of sustainability (Gwilt, 2014; Davis, 2021; Niinimäki, 2024). At the study conducted by Niinimäki (2015), it concluded that choosing co-friendly materials and decreasing waste, designers can contribute to extend product lifecycle by applying recycling, reusing, and repurposing resources. It can be with incorporating renewable resources, also designing the products which are durable and multifunctional (Iqbal et al., 2020; Wu, Zhuang, Zhang & Zhao, 2022; Ezati, Priyadarshi & Rhim, 2022; Rahman, 2023).

By implementing new technologies, such as artificial intelligence for optimized design and production, they can overcome the hurdles and direct the firms to more sustainable practices (Choi & Luo, 2019). In this regard, the growing demand for eco-conscious products and the ongoing growth of sustainable materials and technologies also provide productive ground for designers to innovate and lead the industry toward a more sustainable future (Nilimaa, 2023). They can influence the environmental consequences of fashion products by choosing eco-

friendly materials such as recycled fibres, minimizing waste, and optimizing manufacturing processes. Implementing waste-reduction techniques, such as zero-waste pattern making and upcycling, also help designers minimize fabric waste (Enes, 2019; ElShishtawy, Sinha, & Bennell, 2022; Farghaly et al., 2024).

The contribution of fashion designers is not just about environmental aspects of sustainability, similarly they help to social and economic parts (Agyabeng-Mensah, Afum & Ahenkorah, 2020; Medcalfe & Miro 2021). They can also support local artistes to make sure labor practices is fair and ethical, alongside they consider fair wages and safe working conditions; e.g. they make product with inclusive sizing or design for people with disabilities (Pires et al., 2024). Furthermore, this collaborations with local communities and artists can help to have a stable revenue and maintain culture. Aakko and Niinimäki (2022) in their study discussed that prioritizing social responsibility will lead designers to be more conscious of the human result of their overall process. This can encompass clarifying to produce items with supporting initiatives which can promote diversity, gender equality, and inclusion in the fashion industry (Miotto, & Vilajoana Alejandre, 2019).

While there are many debates in litrature that sustainable practices seem to be more costly especially in initial stages; based on Iqbal et al. (2020), these practices can lead to long-term economic profits. Because recently the appeal for sustainable product in fashion context is increasing, and costumers are eager to make exclusive payment for products aligning with their values. By incorporating durability and versatility into garment design, designers can create products that offer long-term value to consumers, shifting the consumer mindset from "fast" to "slow" fashion (Haines-Gadd at al., 2018; Sarokin & Bocken, 2024). Furthermore, innovation in design and materials can differentiate brands, attract eco-conscious consumers, and enhance competitive advantage (Henninger, Niinimäki, Blazquez & Jones, 2022); designers who embrace sustainability are often seen as innovators, setting themselves apart in a competitive market (Henninger et al., 2022). Therefore, economically, sustainable fashion can drive innovation, open up new markets, and create opportunities for growth, especially for smaller brands and emerging designers. Fashion designers also have the capacity to influence consumer behavior through their design philosophy and branding (Reddy et al., 2023; Jimenez-Fernandez, Aramendia-Muneta & Alzate, 2023). Ethical consumption involves making purchasing and consuming decisions that consider the environmental and social impacts of products. Designers who promote sustainable fashion practices through their collections, can encourage consumers to adopt more eco-consumption behaviors (Park & Kim, 2016; Mandarić, Hunjet & Vuković, 2022). Brands who have incorporated sustainability into their core values, can offer transparency about their materials, design and production processes; these brands can cultivate a loyal customer base, that prioritizes ethical and sustainable products (Connell & Kozar, 2014; Rastogi, Agarwal & Gopal, 2024).

Table 1: Summary of Main Findings in Literature

Author(s) & Year	Topic	Theoretical Approach	Main Findings
Kozlowski et al. (2019); Ma et al. (2024); Rana (2024)	Designers and environmental outcomes	Triple Bottom Line (TBL); Circular Economy (CE)	Influencing design and production choices,

Author(s) & Year	Topic	Theoretical Approach	Main Findings
			designers directly affect sustainability.
Lacasa Santolaya and Biedermann (2016); Pollini and Rognoli (2021)	Design and product lifecycle	Lifecycle thinking; Eco-Design theory	Choices in materials, processes, and disposal influence environmental footprint.
Gwilt (2020)	Comprehensive sustainability approach	Triple Bottom Line	Integrates eco-friendly practices align with the Triple Bottom Line (TBL).
Niinimäki (2015)	Extending product lifespan	Slow fashion movement; Circular economy	Eco-materials, recycling, and reusing, reduce waste and resource use.
Iqbal et al. (2020); Wu et al. (2022); Ezati et al. (2022); Rahman (2023)	Renewable and durable products	Design for longevity; Cradle-to-Cradle	Promote sustainability by integrating renewable resources and long-lasting design.
Choi and Luo (2019)	AI for sustainable design	Technological innovation theory; Industry 4.0	Technology optimizes processes for efficiency and minimal environmental impact.
Nilimaa (2023)	Market-driven eco-innovation	Green innovation diffusion theory	Consumer demand and material innovation encourage sustainable design.
Enes (2019); ElShishtawy et al. (2022); Farghaly et al. (2024)	Waste reduction techniques	Zero-Waste design framework	Zero-waste patterns and upcycling limit textile waste.
Haines-Gadd et al. (2018); Sarokin and Bocken (2024)	Slow fashion approach	Churchill's paradigm	Promotes durable and versatile garments over disposable trends.
Agyabeng-Mensah et al. (2020); Medcalfe and Miro (2021)	Design, Social equity and ethics	Stakeholder theory; Corporate Social Responsibility (CSR)	Fair wages, artisan support, and cultural preservation.

Author(s) & Year	Topic	Theoretical Approach	Main Findings
Pires et al. (2024)	Inclusive design	Universal design principles	Designs for diverse body types and people with disabilities.
Aakko and Niinimäki (2022)	Diversity and gender equality	Social sustainability framework	Incorporates social responsibility into design processes
Miotto and Vilajoana Alejandre (2019)	Cultural and social sustainability	Cultural sustainability theory	Sustainable design promotes cultural and social sustainability in fashion.
Jimenez-Fernandez et al. (2023); Reddy et al. (2023)	Influencing social behavior	Consumer behavior theory	Branding and design encourage ethical consumption habits.
Pookulangara and Shephard (2014); Park and Kim (2016); Mandarić et al. (2022)	Design and promoting eco-consumption	Theory of Planned Behavior (TPB)	Inspires sustainable consumer choices through collections and campaigns.
Padhi (2018); Alahira et al. (2024)	Innovation drives profitability	Innovation management theory	Designers' creativity benefits production and green consumption.
Iqbal et al. (2020)	Long-term profitability	Sustainable business model theory	Sustainable practices yield financial gains despite initial cost.
Henninger et al. (2022)	Competitive advantage	Porter's competitive advantage	Differentiates brands and attracts eco-conscious consumers.
Connell and Kozar (2014); Rastogi et al. (2024)	Transparency and loyalty	Stakeholder theory; CSR	Open communication about production increases customer trust.

Source: Author Own Work

Systematic Literature Review (SLR) Methodology

This study used a systematic literature review protocol to identify and review the available studies about fashion designers' role in sustainability, using Scopus and Web of Sciences databases. Employing a narrative synthesis approach this study analysed and integrated findings from the reviewed literature. As a qualitative method, narrative synthesis relies on the use of words and textual descriptions to summarise and explain patterns across studies rather than statistical combination of results (Skinner, Nelson & Chin, 2022). This approach was selected because the included studies exhibited methodological and contextual heterogeneity, making quantitative meta-analysis inappropriate. The synthesis involved identifying frequent themes, recording conceptual relationships, and interpreting how different findings contribute to understand the research phenomenon (Paul et al., 2021). Hence, this approach was found appropriate to achieve the objectives of this study, as this well-recognized perspective makes the review more comprehensive and consistent. It has enhanced the reliability and precision of the reviews by systematically identifying, screening the relevant studies.

For doing that, first, the overall search was conducted using the label 'sustainable performance,' in total of 2232 studies on the Scopus and Web of Sciences data bases globally. Different word combinations were used to narrow down the research area, e.g., green practices, digital technology, and fashion designers in sustainability, in the context of specific countries. By doing so, the number of articles was reduced to 207 studies for further screening. However, based on relevant themes, 75 papers were reviewed on sustainable performance, digital technology, and green practices in fashion firms relevant to the study scope. The following protocol was used for exclusion and inclusion criteria in SLR study e.g., (see Figure 1).
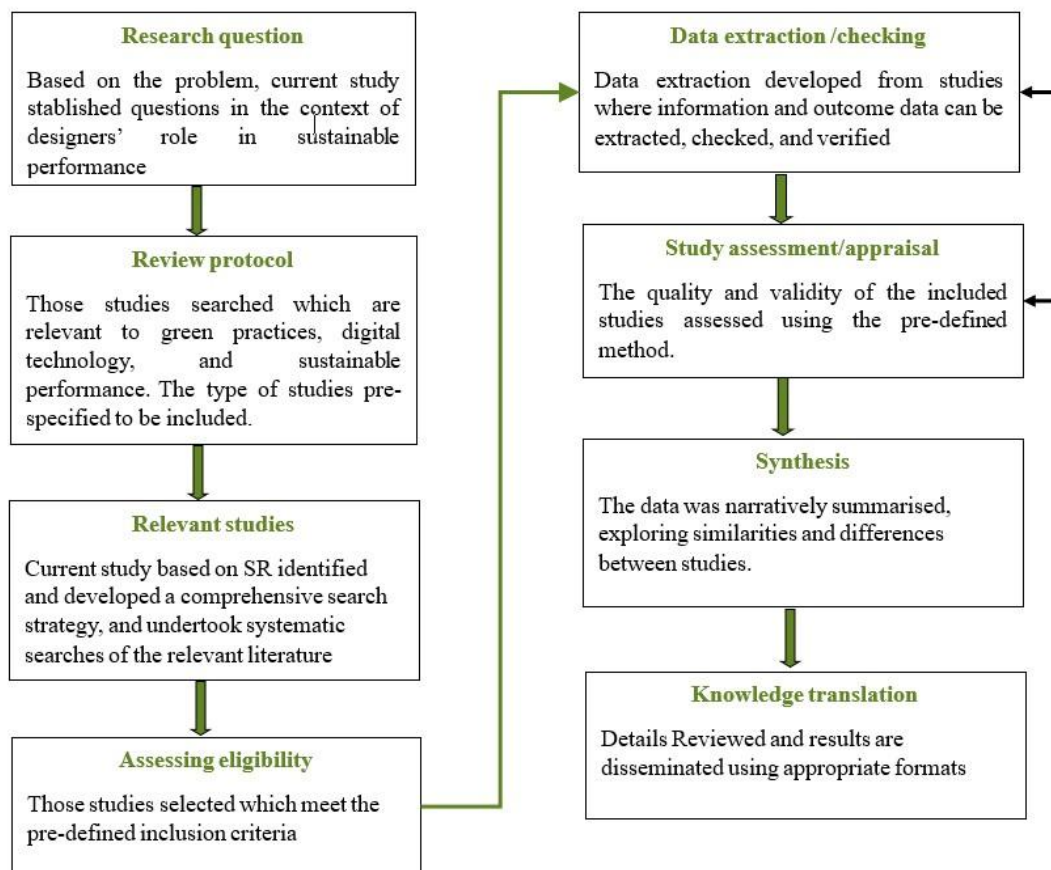

Research question
Based on the problem, current study stablished questions in the context of designers' role in sustainable performance

Review protocol
Those studies searched which are relevant to green practices, digital technology, and sustainable performance. The type of studies pre-specified to be included.

Relevant studies
Current study based on SR identified and developed a comprehensive search strategy, and undertook systematic searches of the relevant literature

Assessing eligibility
Those studies selected which meet the pre-defined inclusion criteria

Data extraction /checking
Data extraction developed from studies where information and outcome data can be extracted, checked, and verified

Study assessment/appraisal
The quality and validity of the included studies assessed using the pre-defined method.

Synthesis
The data was narratively summarised, exploring similarities and differences between studies.

Knowledge translation
Details Reviewed and results are disseminated using appropriate formats

Figure 1: Flow Chart of the Systematic Literature Review Process

This framework of SLR displays a structured model that led researchers in conducting precise and evidence-based review. Each of the eight components ranging from stablishing question to knowledge translation played a vital role in ensuring the quality, credibility, and impact of the review. In the context of fashion designers' role in sustainability including green practices, digital technology, and sustainable performance, applying this framework provided a comprehensive understanding of recent research trends, gaps, and future opportunities suggestions. Using this SLR farmwork helped this study to present some theoretical constructs and empirical evidence from existing studies. As, it is a validated and transparent process which includes identifying, evaluating, and synthesizing related scholarly works to authorise the strength and theoretical grounding of this study. Accordingly, this systematic literature review process contains a structured protocol comprising the different steps (see Table 2).

Table 2: Summary of Systematic Literature Review Process

Stage	Description	Purpose / Outcome
Stablishing the Problem	Developed clear, focused, and answerable problem statement related to green practices, digital technology, and sustainable performance.	Ensured the review scope is relevant, avoids irrelevant studies, and guides the entire review process.
Review Protocol	Created a pre-determined plan outlining search strategy, synthesis approach, and selection criteria.	Maintained reliability, transparency, and consistency throughout the review process.
Relevant Studies	Applied a comprehensive search strategy using selected databases, with keywords and Boolean operators to identify related studies.	Ensured a broad and unbiased collection of studies relevant to green practices, digital technology, and sustainable performance.
Assessing Eligibility	Screened studies based on predefined inclusion criteria: publication date, study type, relevance and subject area.	Filtered out irrelevant or low-quality studies while retaining those contributing to the review objectives.
Data Extraction / Checking	Extracted objectives, findings, and conclusions from eligible studies using a standardized form.	Ensured accuracy and alignment of extracted data with study objectives.
Study Assessment / Appraisal	Assessed quality and validity of studies, rating them (high, medium, low) to minimize bias and ensure strong contributions.	Determined the weight and reliability of each study in the synthesis process.
Synthesis	Applied narrative synthesis to organize and interpret findings, similarities, differences, and patterns.	Generated an integrated understanding of green practices, digital technology, and sustainable performance literature in a structured way.

|		
Knowledge Translation	Translated review findings into theoretical contributions.	Ensured findings are usable for academic and research purposes, and inform future study design.

Source: Author Own Work

Findings

This review paper employed a narrative synthesis in SLR approach to explore the existing literature on fashion designers' roles in promoting sustainability. Databases such as Scopus and WOS were searched using keywords like "fashion designers and sustainability," "green practices," "digital technology in fashion," and "sustainable fashion design," considering articles published between 2014 and 2024 to ensure an emphasis on current practices and technological developments (see Table 3). By synthesizing existing research, this review highlighted how designers contribute to environmental, social, and economic sustainability through their creative processes. It identified key trends, and factors fashion designers employ in integrating sustainability into their work, offering insights for future research.

Table 3: Summary of Main Findings

Author(s) & Year	Topic	Main Finding
Fletcher (2014); Hethorn and Ulasewicz (2015); Deschamps, Carnie and Mao (2017); Wang et al. (2018); Centobelli et al. (2022); Mason, Pauluzzo and Umar (2022); Rehman et al. (2024); Voukkali et al. (2024)	Sustainable material selection and environmental impact	Using eco-friendly, organic fibers, recycled fabrics, and biodegradable materials lowers water use, energy consumption, and chemical pollution.
Black (2014); Fletcher (2014); Rissanen and McQuillan (2023); Moreira and Marques (2023)	Waste minimization through design techniques	Zero-waste design, efficient pattern cutting, upcycling, and repurposing extend product life cycles and reduce textile waste.
Chapman (2014); Park and Lin (2020); Wu et al. (2022); Piippo, Niinimäki and Aakko (2022); Sehnem et al. (2024)	Lifecycle approach to fashion design	Designing garments to be durable, repairable, and recyclable encourages long-term use and supports a circular economy.
Ozdamar Ertekin and Atik (2015); Seo and Jin (2024)	Circular economy practices	Promoting second-hand fashion, take-back programs, and closed-loop recycling keeps materials in use for longer.
Gwilt (2014); Blas Riesgo, Codina and Sádaba (2023); Pires et al. (2024)	Promotion of slow fashion principles	Creating high-quality, long-lasting garments and smaller collections reduces overproduction and promotes sustainable consumption.

Author(s) & Year	Topic	Main Finding
Wang and Du (2021); Wiegand and Wynn, (2023); Casciani, Chkanikova and Pal, (2022); Javaid (2022); Vanderploeg, Lee and Mamp (2017); Robertsone and Lapiņa (2023); Vărzaru and Bocean (2024)	Advanced technologies and sustainable fashion design	Digitalization, VR, smart textiles, and other innovations allow designers to integrate sustainability while maintaining creativity and innovation.
Vanderploeg, Lee and Mamp (2017); McQuillan (2019); Sheikh, Waheed, Khalid and Qureshi (2020); Jimenez-Ordonez et al. (2023); Pavlin et al. (2024)	3D printing and virtual prototyping effect on waste and overproduction	Designers can experiment with complex shapes, make-to-order items, and visualize products in 3D without physical samples, reducing excess inventory and resource waste.
Budinoff and Kramer (2022); Hunde and Woldeyohannes (2022); Xue et al. (2024	Digital tools and design efficiency	CAD software, digital pattern-making, and virtual fitting rooms reduce the need for multiple prototypes, saving materials, energy, and lowering return rates.
Stoppa and Chiolerio (2014); Liu, Shaari and Zhang (2024); Hossain et al. (2024); AanchalManuja et al. (2024)	Smart textiles and innovative fabric technologies extend product life	Wearable tech fabrics reduce washing frequency, increase functionality, and lengthen product lifecycle, supporting sustainable consumption.
Minh and Ngan (2021); Silvestri (2022); Casciani and D'Itria (2024)	Virtual fashion events and collections effect on environmental impact	Virtual fashion shows and digital-only collections decrease resource use in events and production, fostering eco-fashion consumption.

Source: Author Own Work
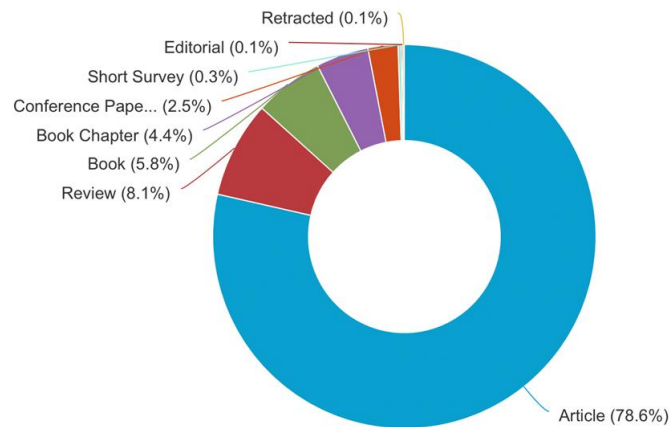
Figure 2: Studies on Sustainable Performance by Documents Type
Source: Scopus (2024)
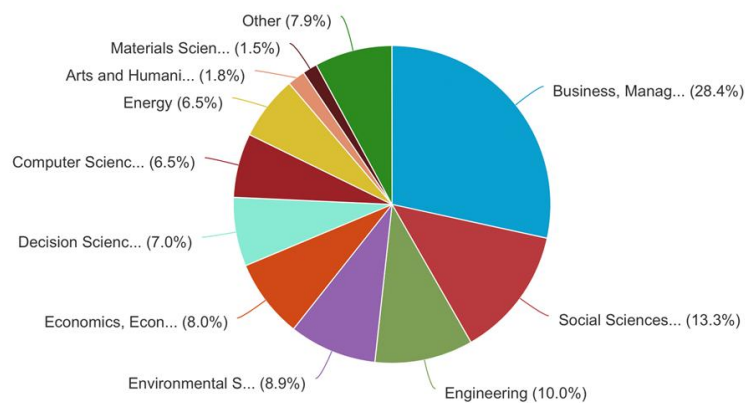
Figure 3: Studies on Sustainable Performance by Subject Area Yearly
Source: Scopus (2024)

Conclusion

This systematic review explored the literature about fashion designers' role in boosting sustainability; with integrating the existing studies on how designers can support economic, environmental, and social performance within fashion industry using their green practices in design and production methods. The objectives of this paper were successfully achieved by conducting the comprehensive review of existing literature and synthesizing key insights on the role of fashion designers in enhancing sustainable performance. By exploring current literature, this systematic review outlined the significant part designers can play to proceed sustainable performance in fashion industry. According to the findings of this review based on many studies, using eco-conscious strategies i.e. eco-material sourcing, circular design and waste reduction, fashion designers would be at main part to address sustainable challenges raised by the fashion firms. Therefore, their commitment to design and produce sustainably will lead to decrease environmental impact, also support social and economic sustainability.

Furthermore, according to literature, by incorporating technology fashion designers can improve sustainable design. As these technologies can help them to experience the processes which are more resource-efficient with waste reduction, while promoting eco-production and

consumption patterns. In this regard, designers who also include multifunctionality and durability into their practices, can make products which have longer life cycles and at the same time can offer greater value for both the firm and consumer. Hence, embracing sustainability can assist fashion firms to advance their economic performance, considering eco-conscious consumers and reducing the costs of production, which in turn can differentiate themselves in the competitive market. In result, fashion designers as keys to integrate sustainability into the fashion sector, not just create artistically fashionable products, but also make strategic decisions about green materials, sustainable production methods, and product life cycles. The conclusions of this review are according to the integrated findings from systematic literature review; therefore, future studies applying empirical data, will be able to increase the strength of the efficient implications. Strategies derived from literature may not capture emerging industry practices or regional variations. Using empirical studies including, surveys, interviews, or case studies about fashion designers' role in sustainability, further studies can validate and improve the findings of current review, suggesting more practical perspectives for stakeholders.

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