Systematic Review

A Systematic Literature Review of Fashion, Sustainability, and Consumption Using a Mixed Methods Approach

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Abstract: With the growing global awareness of the environmental impact of clothing consumption, there has been a notable surge in the publication of journal articles dedicated to "fashion sustainability" in the past decade, specifically from 2010 to 2020. However, despite this wealth of research, many studies remain disconnected and fragmented due to varying research objectives, focuses, and approaches. Conducting a systematic literature review with a mixed methods research approach can help identify key research themes, trends, and developmental patterns, while also shedding light on the complexity of fashion, sustainability, and consumption. To enhance the literature review and analytical process, the current systematic literature review employed text mining techniques and bibliometric visualization tools, including RAKE, VOSviewer, and CitNetExplorer. The findings revealed an increase in the number of publications focusing on "fashion and sustainability" between 2010 and 2021. Most studies were predominantly conducted in the United States, with a specific focus on female consumers. Moreover, a greater emphasis was placed on non-sustainable cues rather than the sustainable cues. Additionally, a higher number of case studies was undertaken to investigate three fast-fashion companies. To enhance our knowledge and understanding of this subject, this article highlights several valuable contributions and provides recommendations for future research.

Keywords: systematic literature review; fashion; sustainability; consumption; mixed methods research; text mining; content analysis; bibliometric analysis

1. Introduction

According to Google Search Trends (2010–2021), the global search volume for terms such as "sustainable fashion", "fashion clothing", and "fast fashion" has shown a significant surge since 2016, particularly in the case of "sustainable fashion". Fast fashion often refers to inexpensive rapidly changing fashion trends that subsequently leads to excessive consumerism [1]. In response to negative perceptions associated with the brands, numerous fast fashion companies have taken steps to address sustainability concerns throughout their product design, production, and distribution processes. These efforts encompass implementing circular product design, adopting zero-waste production methods, improving supply chain management, and conducting product end-of-life assessments. For example, H&M, Topshop, and Zara unveiled their sustainable collections, namely the 'Conscious' collection in 2011, the 'Ready to Reclaim' eco-conscious label in 2012, and the 'Join Life' sustainable collection in 2016, respectively [2]. Likewise, fast fashion retailers such as H&M, Zara, Uniqlo, and The Gap have implemented various clothing recycling or "take back" programs aim at reducing waste and addressing throwaway culture [3,4].

With the growing global awareness of the environmental impact of clothing consumption, there has been a notable surge in the publication of journal articles dedicated to "fashion sustainability" in the past decade, specifically from 2010 to 2020 [5]. In addition, this period witnessed a rise in the launch of new fashion journals, accompanied by a noticeable increase in the number of Special Issues dedicated to topics such as "sustainability

in fashion and textiles", "sustainable development", "sustainable practices", and "green consumption". Notable additional journals to the field of "fashion" and "sustainability" include the *Journal of Global Fashion Marketing* (2010), *Fashion and Textiles* (2014), *International Journal of Fashion Studies* (2014), *Sustainable Production and Consumption* (2015), and *Clothing Culture* (2013), among others. The proliferation of scholarly research in the field of fashion sustainability can be attributed to the expanding awareness, growing interest, and heightened recognition of its importance. However, despite this wealth of research, many studies remain disconnected and fragmented due to varying research objectives, focuses, and approaches [6]. Conducting a systematic literature review with a mixed methods research approach can help identify key research themes, trends, and developmental patterns, while also shedding light on the complexity of fashion sustainability.

2. Research Approach and Objective

Although a systematic literature review is an effective method "to identify, appraise and synthesise all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question" [7], the manual search, review, identification, and classification of information from a vast amount of the existing literature can be a daunting task. To enhance the literature review and analytical process, the current systematic literature review employed text mining techniques and bibliometric visualization tools. As Hey and Trefethen [8] and Huggett [9] point out in their studies, the overwhelming amount of data, often referred to as the "data deluge", "information overload", and "filter failure", present an increasing challenge for conducting systematic review in the social science field. The traditional manual approach to systematic review becomes time-consuming and difficult to manage in the light of the proliferation of textual information. Manual searching and screening of the published literature and unpublished dissertations/theses can be fatigue-inducing and laborious. Many existing research methods and tools lack the capacity to handle such vast amounts of data. As Ananiadou et al. [10] (p. 511) assert, "Complex systematic reviews can take more than a year to complete with up to half of that time being spent searching and screening hits". In summary, the utilization of text mining techniques can help researchers reduce searching time, costs, and biases. In this study, text mining techniques were explored and utilized to extract and transform unstructured text into structured datasets for analysis. As stated by Tkach [11] (p. 15) in an IBM white paper, various text mining tools, including TextMiner, can process "the Boolean condition efficiently, and it is easy to search several categories at once".

However, it is important to acknowledge that text mining cannot completely replace human involvement, especially when dealing with complex tasks [12]. Therefore, various techniques and research approaches were adopted in this study. Alongside text mining of publications, content analysis was performed to facilitate the process of data classification, and visualization tools were employed for bibliometric analysis. Although content analysis may entail subjective judgment, this analytical process allows investigators to ensure that the data (in this case, "publications") are classified in a way that aligns with the researcher's concepts or framework. Moreover, through the utilization of various research methods and analytical tools, data triangulation can be achieved [13]. In essence, triangulation analysis enhances the reliability and validity of the data, while also complementing or reinforcing the findings derived from the employed methods.

The overarching objective of this systematic literature review is to acquire a comprehensive understanding of the research evolution, development, and emerging trends in the field of fashion and sustainable consumption over the past decade. The review encompasses an eleven-year timeframe, spanning from 2010 to 2021. One of the primary purposes of this literature search and review was to identify, classify, and analyze "apparel, clothing/clothes, fashion and garment" (A/C/F/G) articles related to sustainability throughout the lifecycle of apparel products. This includes the examination of both fashion production/design from the practitioners' and consumers' perspectives, with a greater emphasis being placed on the clothing selection and consumption aspects.

To summarize, the current literature review served the purpose of not only comprehending the research trends, evolution, and gaps but also identifying the prominent product attributes, including both sustainable and non-sustainable cues. The aim was to pinpoint pertinent and meaningful cues to guide future research on investigating apparel in consumers' choices and preferences. Consequently, Stage 1 was employed to gain a broader understanding of the research trends and the development of "fashion and sustainability" research, while Stage 2 was designed to deepen our understanding of fashion consumer research in relation to sustainability, encompassing the identification of major research areas and salient product evaluative cues.

To enhance the transparency of reporting systematic reviews, we adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines and followed the PRISMA checklist and four-phase process, which include identification, screening, eligibility, and inclusion.

Fashion Consumption, Sustainability, and Evaluative Cues

Scholars have noted that fashion consumption and sustainability cover a broad range of topics [14], making it impractical or unfeasible for a single study to address all the important questions and issues. Therefore, the current study focuses on identifying the prevailing research trends and advancements, as well as investigating consumer behaviour in relation to product cue utilization specifically within the realm of fashion. By narrowing its scope in this manner, we believe that the current study can provide valuable insights into this specific area of interest while still acknowledging the broader context of fashion consumption and sustainability. For example, a systematic literature review can be used to identify relevant cross-national publications on fashion sustainability. The findings derived from such a review offer valuable information for reference and serve as a foundation for future research.

When it comes to apparel shopping situations, consumers often take into account a wide array of product cues to justify their choices or purchasing decisions [15,16]. However, there is scarcity of empirical research examining the influential effects of both sustainable and non-sustainable cues on apparel consumption within a single study [17].

Prior to the 1960s, research on product evaluation was primarily centred around a single cue, such as price or brand name [18]. However, this single-cue approach has faced criticism due to its low reliability, biased results, overemphasis on one specific cue, and failure to capture important latent constructs such as perceived value [19]. To overcome these limitations, researchers [20,21] have advocated for a multiple-cue approach, which can yield more reliable results, avoid exaggeration of the impact of a single product cue, and better reflect real-market buying situations.

To reiterate, many consumers do not rely solely on a single attribute when making purchasing decisions. Instead, they consider multiple cues to fulfill their diverse needs and personal goals. Since the early 1970s, scholars have shown a growing interest in multiple-cue research, leading to numerous apparel studies that have examined various product cues, rather than focusing on a single cue or two relational cues (e.g., brand and quality, price, and country of origin). With this perspective, conducting a literature review to examine the frequency of keyword occurrences related to both sustainable and non-sustainable product cues would be useful for future research endeavours.

3. Research Methods

3.1. Initial Search

As mentioned earlier, many new fashion and sustainability journals were launched during the 2010s. Considering these observations, it would be reasonable and logical to embark on an extensive literature review spanning from 2010 to 2021 in order to acquire a more profound comprehension of the latest research advancements to this specific field. The data were collected by the first author.

For the retrieval of relevant research papers, Clarivate Analytics's Web of Science (WoS) was utilized as primary resource. Web of Sciences, with its inclusion of social sciences literature, makes it a more pertinent database for the current study in comparison to numerous others [22,23]. The search process involved scanning "all fields", which encompassed publication titles, affiliations, publishers, paper titles, author keywords, abstracts, and content. Despite its comprehensive nature, the search was focused exclusively on A/C/F/G, deliberately excluding other consumer products such as mobile phones, automobiles, appliances, and electronics. It is worth noting that within the context of this study, all apparel products including footwear, fashion accessories (handbags, backpacks, gloves, etc.), beauty care, and cosmetics were considered, with clothing being the primary focus.

The literature search was conducted using structured search strings consisting of topic-related keywords and Boolean combinations of keywords: [fashion OR clothing OR clothes OR apparel OR garment] AND [sustainab*]. Boolean operations or retrieval systems have been extensively utilized in systematic literature review research [24]. The application of these search criteria led to the identification of 4971 research papers published within the years 2010 and 2021.

3.2. Stage 1—First Round of Reviewing and Screening

A/C/F/G was used as the primary criterion for the initial search of the relevant literature, and then a first-round screening was performed to ensure the selected publications were specifically related to A/C/F/G. To ensure the search results align with the current research scope and topic, a screening process was implemented. In this stage, 860 publications related to A/C/F/G and sustainability were selected and retained for further analysis. The selected literature covers a wide range of disciplines, including fashion and clothing, consumer behaviour, design, education, marketing, business, management, retailing, sustainability, and more. However, research centred around scientific and engineering disciplines or non-A/C/F/G-related topics such as engineering sciences, textile chemistry, and textile engineering research (e.g., fibre science, textile engineering, textile production, nanotechnology, etc.) were excluded.

Although fashion and textiles are closely intertwined, it is important to note that the current research does not focus on textile engineering and production, as they fall outside the scope of this research. Instead, the primarily focus of this research revolves around fashion, sustainability, and consumption.

Apart from excluding literature from unrelated disciplines or topics, the current review also omits books, book chapters, book review articles, editorial materials, theses/dissertations, conference proceedings, working papers, and public reports. Moreover, only publications written in the English language were considered. A total of 77 publications written in languages other than English were excluded, which included 21 papers in Spanish, 18 in Portuguese, 8 in German, and various others.

Although many of the identified articles are related to A/C/F/G and sustainability, a significant portion of them focus on "materials science" and "textile science and engineering" rather than fashion consumption in relation to sustainability. Therefore, a screening process was undertaken to narrow down the selection. After undergoing the review and screening, a total of 4111 articles were removed from the dataset, leaving 860 papers for further review and analysis in this stage (as indicated in Figure 1).
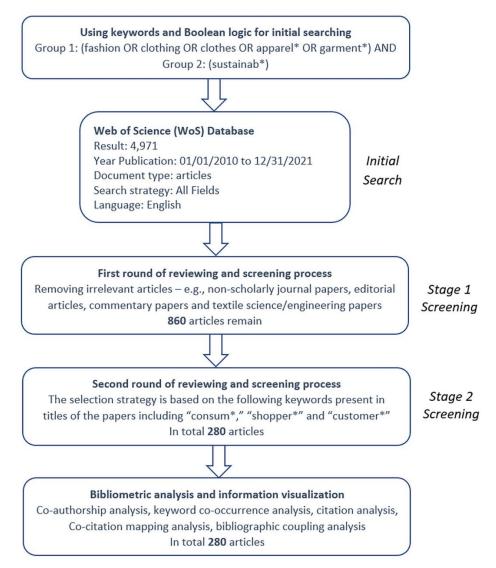
Figure 1. Summary of the systematic literature review flow diagram. * The truncation/wildcard symbol is used to search for the root of a word, including alternative word forms or plurals.

3.3. Stage 2—Second Round of Reviewing and Screening

In the initial round of screening, a total of 860 papers were selected for further review, covering a wide range of topics related to various stages of the fashion lifecycle, including "production", "shopping", "consumption", and "post-consumption". Since the primarily focus of the current study was to examine consumers' perspectives on shopping, evaluation, decision-making, and consumption behaviours, papers containing keywords such as "consumer(s)" and "consumption" were taken into consideration during the second round of screening. Additionally, based on previous experience and observations, we noticed that similar terms such as "customer(s)", "shopper(s)", and "buyer(s)" were also used in research studies, particularly within the field of retailing. Hence, the following Boolean keywords were identified for screening purposes: "consum*", "customer*", "shopper*", and "buyer*".

During the second round of screening, the titles of each paper were carefully scanned and reviewed to ensure their alignment with the research focus of the current study, which centres around three key areas: fashion, sustainability, and consumption. The findings revealed that the words "consum*" ($n = 298$ including 101 occurrences of "consumption") were frequently used words when studies investigated consumerism-related topics, followed by "customer*" ($n = 14$) and "shopper*" ($n = 5$). Interestingly, out of the 860 papers,

none of them included the keyword "buyer*" in their titles, which is unexpected. As a result, 280 articles meeting these criteria were identified as relevant for further analysis.

3.4. An Overview of Text Mining

Feldman and Dagan [25] introduced text mining (TM) or text analytics as a knowledge discovery tool, which has found wide application in numerous studies. For example, text mining has been employed for systematic literature review across various disciplines, encompassing medicine [26], psychiatry [13], mobile technologies [27], sustainability [28], fashion [29], customization research [30], and information management [31]. Text mining serve as a potent analytical tool capable of handling a large amount of literature and written text, thereby enhancing literature search and classification processes.

There are several compelling reasons or advantages for employing text-mining in systematic literature review:

1. It enables the identification, retrieval, and extraction of key topics automatically and efficiently.
2. It facilitates the discovery of novel information and patterns from large text corpora.
3. Many text mining software options are user friendly.
4. The data obtained can be used for training, validation, and predictions to improve generalization to a larger sample or population.
5. Text mining helps reduce processing time and minimizes human error.

Text mining is closely associated with data mining and knowledge discovery techniques, as it allows for extracting valuable information from various sources, encompassing structured data such as databases and unstructured data such as plain text documents. Through leveraging text mining, researchers can enhance the process of the literature search by identifying, comparing, and interpreting the occurrence of words within a given language. Furthermore, text mining enables the extraction and transformation of textual data into meaningful information and categories, thereby enhancing the understanding of the analyzed content.

According to Miner et al. [32], the key steps of TM can be summarized as follows: (1) creating a corpus, (2) preprocessing the corpus, (3) extracting knowledge, and (4) comparing and validating the results. Information retrieval (IR) plays a crucial role in searching, acquiring, and identifying information rather than performing data analysis. IR serves the purpose of obtaining relevant information from textual data such as PDF articles, which includes the paper's title, abstract, author keywords, and content. Moreover, IR helps mitigate information overload by eliminating redundant, irrelevant, or unwanted information.

Once the information retrieval and extraction are complete, a classification model can be developed using various algorithms, such as Support Vector Machine (SVM), Regression, K-Nearest Neighbours, Naïve Bayes, Neutral Networks, Decision Trees, Association Rule-based, and/or Boosting. Text classification, an application of machine learning, involves training the machine with data from predefined categories to enable automatic classification of new textual information.

3.5. Keyword Search, Retrieval, and Categorization

Given the extensive volume of articles on "fashion and sustainability", text mining techniques and Natural Language Processing (NLP) technologies were used for this systematic literature review analysis. In the first round of reviewing and screening, keyword extractor models were used to extract key terms from the titles, author keywords, and abstracts of the publications, facilitating the identification of popular topics. Additionally, the researchers enhanced a transformer-based language model to classify the papers based on the research trends, author affiliations, and geographic locations and performed various text network visualization analysis. For example, visualization tools including VOSviewer and CitNetExplorer were used in this study to present the findings.

The bibliometric analysis encompassed co-citation analysis [33,34], bibliographic coupling [35,36], and co-occurrence of author keywords, and collocation analysis [37] can be performed. These analyses facilitated the exploration of trends in publications, citations,

authors, keywords, and countries. Visual representations in the form of network maps were employed to visually depict these trends, offering valuable insights into the interconnected relationships among various components.

Clarivate Analytics's Web of Science (WoS) was widely used in the systematic literature review to retrieve relevant research papers. This comprehensive database offers a broad array of data-intensive articles across diverse knowledge domains. In the current study, WoS was employed to search for pertinent papers and extract their metadata in plain text format. The exported tags included authors' names and affiliations, paper titles, journal titles, keywords, abstracts, cited references, and publication years. As indicated in Figure 1, a total of 4971 papers were retrieved from WoS databases. The data crawling procedure involved concatenating the known title with a public query searching Uniform Resource Locator (URL). This process commenced by fetching the synthesized URL to acquire the primary key paperID of the specific paper in the database, and then the metadata were searched using the unique paperID. Using this method, the metadata of all relevant papers were collected, followed by a descriptive analysis to identify the recent research trends and pattern relating to various facets of "fashion and sustainability". Although text mining can swiftly identify and categorize papers into different groups, manual content analysis is still necessary to ensure the accuracy of categorization. In certain cases, the frequency of keyword occurrence may not accurately reflect the research focus or intended meaning. For example, the keyword "brand" might encompass aspects such as branding strategy, brand positioning, brand assets, brand equity, and brand identity, but it may not be specifically related to fashion consumption or consumerism.

Apart from analyzing publication keywords, the study also identified and categorized the geographic focus of each publication (e.g., Eastern/Western and developed/developing nations). Moreover, the type of research (e.g., case study or systematic literature review), the employed research methodology (e.g., qualitative, quantitative, or mixed methods), and frequently used theory (e.g., Theory of Planned Behaviour) were revealed. This analysis enables the identification of research trends and gaps, while the findings of this systematic literature review provide valuable information, including narrowing the scope for future research.

3.6. Exploratory Keyword Extraction Using RAKE

Keywords can be defined as a sequence of one or multiple words (a phrase) that concisely encapsulates the essence of a document's content. They are extensively used in many studies to formulate queries within information retrieval (IR) systems [38]. Keyword extraction, also known as keyword detection or keyword analysis, is a text analysis technique that automatically extracts the most frequently used and/or significant keywords found in a particular document. This approach helps in summarizing the content of the text and identifying the key topics discussed. In this research, we employed a statistical keyword extraction algorithm called Rapid Automatic Keyword Extraction (RAKE) in Stage 1.

- Extraction or content words = Corpus − stopwords − delimiters

Every journal paper comprises a diverse range of words that can be divided into sequences of contiguous words by specified word delimiters. RAKE is a novel, efficient, unsupervised, and domain-independent tool used for extracting keywords/phrases from the textual content of documents, such as abstracts. This process involves parsing the text into a collection of candidate keywords. Once the candidate keywords have been identified from the text, the score of each keyword is calculated by considering the degree and frequency of word co-occurrences. This calculation involves three metrics: word degree (deg(w)), word frequency (freq(w)), and the ratio of degree to frequency (deg(w)/freq(w)).

In addition to examining the title and keywords of a paper, it is important to scan its abstract because the terms apparel, clothing/clothes, fashion, and garments (A/C/F/G) may not appear in the paper titles. For instance, some articles may include terms such as "corporate social responsibility or CSR", "collaborative consumption", "zero-waste

design", "organic T-shirts", "recyclable denim jeans", and "green retailers" in the titles without explicitly mentioning one of these keywords—A/C/F/G. However, the abstracts could mention terms such as "fashion consumers" "clothing store", and "apparel industry". Moreover, in many cases, fashion brand or company names such as Zara, H&M, GAP Inc., Patagonia, Boohoo, Shein, etc., are used in the paper titles instead of A/C/F/G. Although text mining is capable of identifying and quantifying the frequency of keyword occurrences, it has limitations when it comes to fully interpreting all the data in an ideal and accurate manner. Therefore, alongside text mining, manual checking and analysis are deemed necessary to ensure a comprehensive understanding of the information.

3.7. Word Cloud Visualization

A word cloud is visualization technique for text data where the most frequently occurring word is displayed in the largest font size. In the previous section, we employed the RAKE algorithm to assess the importance of each keyword identified from the previous literature. Using the Python library "Word-Cloud" [39], a diagram (Figure 2) was created with the RAKE score representing the weight of each keyword. To enhance visual presentation, the words in the Word Cloud were assigned colours using a qualitative colour map called "Dark2" provided by the Python plotting library, "Matplotlib".

Figure 2. Word cloud: the occurrence of keywords associated with the topic of "fashion and sustainability".

However, it is important to note some drawbacks or limitations of Word Clouds, Firstly, they do not display multi-word phrases. Secondly, they do not provide explanations for the relationship between words. Thirdly, they do not group words with the same or similar meanings (e.g., "clothing" and "clothes"). Lastly, they lack contextual information [40]. Although Word Clouds cannot fully illustrate the relationship between words, they can serve as indicators to provide a high-level overview of the context or topic. As depicted in Figure 2, related words are positioned closer to the larger keywords in a semantic sense. For example, words such as "organic", "comfort", "colour", "cost", "child labour", and "made in" are placed in proximity to the keyword "material".

It is essential to emphasize that the word cloud shown above exclusively displays the keywords associated with apparel attributes. These keywords can be served as a foundation for developing hypotheses for empirical testing to assess their relative significance in comparison to others, particularly in the context of product evaluation. Although this word

cloud offers useful information into the frequency occurrence of diverse attributes related to sustainable and non-sustainable aspects of clothing, it is imperative to acknowledge and address its inherent limitations and shortcomings.

4. Results

4.1. Stage 1: Findings

4.1.1. Identifying and Enhancing Data Quality

After identifying 860 papers in Stage 1, RAKE was employed to conduct a comprehensive scan of each PDF document, including paper title, author keywords, abstract, and content. The scan aims to identify significant keywords related to product attributes, specifically focusing on both apparel sustainable and non-sustainable cues, for further analysis. Scanning the entire document is necessary because the title, author keywords, and abstract lack sufficient space to enumerate all the investigated attributes. In many cases, intrinsic evaluative cues alone encompass a wide array of attributes, such as fabric, colour, style, garment fit, durability, comfort, ease of care, versatile, quality, and stretchability. Put simply, conducting a full scan ensures that the product cues are not overlooked or left undiscover.

To conduct data review and analyze manually, content analysis was used as a guiding method to analyze the identified keywords within their respective contexts. Content analysis is a systematic research tool for identifying, categorizing, and generating reliable findings from literature review [41]. Both qualitative and quantitative approaches and open coding techniques were used to analyze the data (keywords and phrases) of each paper. This process entails reading and comprehensive the selected papers and relevant keywords/phrases within their specific context. It also involved assigning codes to label the data, making notes, and identifying the emergent themes along the way [42].

Data coding and categorization are important processes prior to the analysis and interpretation phase. As recommended by other researchers [43], discussions among independent coders are imperative. Through open dialogue, a consensus can be reached on how to effectively organize and interpret the collected data. Following the initial coding process, the coder revisited the datasets to identify and code sub-themes within the nodes. In this study, two coders were involved in this process, and the review authors/coders had no competing interests in conducting this study.

4.1.2. Identification of Apparel Product Cues

Based on the keyword occurrences depicted in Word Cloud (Figure 2) and drawing from the researchers' previous experience and knowledge, a variety of sustainable and non-sustainable cues related to apparel were further identified, as shown in Table 1. During the content analysis, we observed that certain keywords might receive excessive weight or be overemphasized due to their overall frequency. For example, the word "brand" may appear multiple times in the title, author keywords, abstract, and content of a paper (e.g., brand extension, brand knowledge, brand positioning, and perceived brand value), but not all instances necessarily pertain to product attributes or how consumers use the "brand" cue to guide their purchasing decisions. Additionally, multiple counting of the same word can inflate or amplify its significance.

To mitigate overemphasis of keyword occurrences depicted in Word Cloud (Figure 2), we used an approach where multiple occurrences of the same keyword within a paper were treated as a single occurrence. We prioritized the relevance of keywords to the research topic rather than their frequency. By doing so, we focused on the keywords that were directly connected to the subject matter, allowing for a more meaningful classification. For example, sub-themes such as non-sustainable product cues, sustainable product cues, and sustainable production cues were identified and coded.

- *Non-sustainable Apparel Cues:* (1) psychic or aesthetic cues—including colour, garment fit, style/design, and fabric; (2) physical or functional cues—such as durability, comfort, and garment fit, among others.

- *Sustainable Apparel Cues:* recyclable clothing, certified eco-label, and certified ethical label.
- *Sustainable Production Cues:* less energy usage, energy saving, less water usage, no child labour, fair wages, worker safety, no animal skin use, and mitigation of air pollution.

Table 1. Keyword occurrences of sustainable and non-sustainable product cues.

Apparel Product Cues	Frequency of Keyword Occurrences
Colour	13
Style	71
Durability	23
Comfort	13
Garment fit	16
Fabric (materials)	56
Quality (workmanship)	58
Versatility (wardrobe coordination)	7
Ease of care	8
Brand	44
Country of origin	16
Price	63
Garment life (recycle)	29
Certified sustainable labels (eco/ethical labels)	41
Less water usage (water quality)	41
Air quality (pollution)	15
Less energy usage	47
Chemicals usage	6
Worker safety (working condition)	26
Fair wages	19
Human/Workers' Right	13
No child labour	15
No animal skin usage (animal welfare)	21

This approach enabled us to determine the number of publications that focused on or investigated specific product attributes during the period from 2010 to 2021. As indicated in Table 1, the most extensively studied and discuss product attribute was style ($n = 71$), followed by price ($n = 63$), quality ($n = 58$), and fabric/materials ($n = 56$). Regarding sustainable product cues, the attribute that garnered the most attention and discussion was energy usage/consumption ($n = 47$), followed by water usage/consumption ($n = 41$) and certified labels including all ethical/eco-labels ($n = 41$). It is important to note that all the chosen publications are specifically related to the topic of "fashion and sustainability". Thus, many studies did not include colour and comfort as investigated cues. Nevertheless, in cases where studies focus on fashion or clothing without taking sustainability factor into account, colour, comfort, versatility, and ease of care are often included among a wide array of product cues for empirical testing. Indeed, a considerable number of previous studies [44–47] on apparel predominantly or exclusively focused on non-sustainable cues, incorporating both comfort, colour, versatility, and ease of care for empirical investigation. Hence, it is logical and justifiable to include these intrinsic cues in the findings. However, it is important to note that the attributes presented in Table 1 are not intended to be exhaustive or comprehensive. The review specifically focused on publications related to "fashion and sustainability" between 2010 and 2021. As a result, it is important to interpret these findings with caution and recognize their limitations.

4.1.3. Research Trends and Publication Patterns

After removing the duplicated and irrelevant papers, 860 papers remained in the dataset for descriptive analysis, providing insights into recent research trends and focuses. Figure 3 illustrates a significant surge in the number of publications on "fashion and sustainability" from 20 papers in 2010 to 171 papers in 2021. Notably, there was a substantial

increase of approximately 28% from 2020 to 2021, underscoring the sustained interest and attention of researchers in this field.
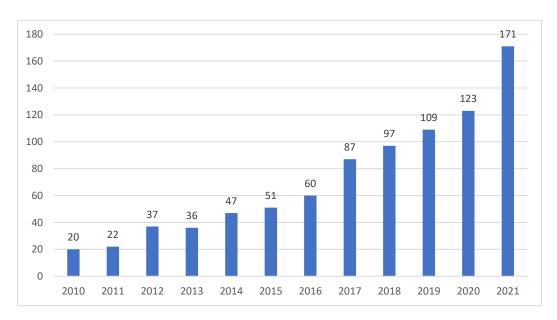

Figure 3. Number of papers published each year from 2010 to 2021.

These findings demonstrate the prevalence of "fashion and sustainability" as a subject of interest among researchers. The relevant papers ($n = 860$) were identified from 145 journals across different disciplines. Among these journals, 74 (51%) published only one paper; 57 (39.3%) published 2–10 papers; and 14 journals (9.7%) published more than 10 papers between 2010 and 2021. Figure 4 reveals that out of the 14 journals with higher publication numbers, eight belong to the category of "fashion and textiles"; three are categorized as "consumer and retail"; two fall under "sustainability"; and one is classified as "design".
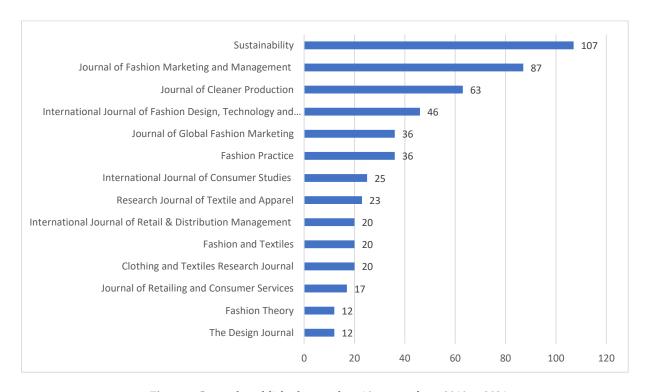

Figure 4. Journals published more than 10 papers from 2010 to 2021.

Remarkably, the journal *Sustainability* has published the highest number of papers (*n* = 107) related to "fashion and sustainability" in the past 11 years. It is followed by the *Journal of Fashion Marketing and Management* (*n* = 87) and *Journal of Cleaner Production* (*n* = 63).

Among the 860 papers analyzed, 750 publications had one or two keywords (apparel, clothing/clothes, fashion, and garment, or A/C/F/G) included in their title, as shown in Table 2. This means that 110 publications did not use these keywords (A/C/F/G) in the paper title. Therefore, scanning keywords and abstracts provided by the authors becomes necessary. For example, some authors may employ alternative keywords or phrases like "corporate social responsibility "(CSR)", "H&M", "ZARA", "organic T-shirt", "zero-waste design", "green retailer", or "collaborative consumption" in their title, and the research is related to "fashion and sustainability".

Table 2. Number of occurrences of A/C/F/G in the title.

Keyword(s) Appear in the Paper Title	Number of Occurrence
Only "Fashion"	402
Only "Apparel"	152
Only "Clothing/Clothes"	120
Only "Garment"	18
Both "Clothing/Clothes" and "Fashion"	24
Both "Fashion" & "Apparel"	26
Both "Clothing/Clothes" and "Apparel"	2
Both "Fashion" and "Garment"	6
Total	750

The findings presented in Table 3 reveal that 346, 228, and 27 papers employed quantitative, qualitative, and mixed-method approaches, respectively. Moreover, apart from these three primary research approaches, other methods such as the experimental design approach and practice-led research were also employed. Additionally, Table 3 reveals that out of the papers analyzed, 93 were case studies, 34 were systematic literature reviews, 13 were other review papers, and 6 were conceptual papers. Notably, the number of "systematic literature review" papers has experienced growth since 2016, with the exception of 2019, as shown in Figure 5.

Table 3. Research approaches and types of paper.

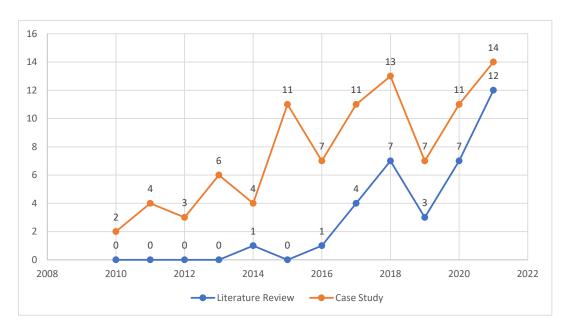| Research Approaches and Types of Paper	Number of Papers
Research Approach	
Quantitative	346
Qualitative	228
Mixed Methods	27
Types of Paper	
Case Study	93
Systematic Literature Review	34
Conceptual Paper	6
Other Review Paper (e.g., critical review)	13

Figure 5. Case study and systematic literature review papers published from 2010 to 2021.

4.1.4. Case Study Papers

Regarding case study papers, some research focused on a single topic or company, while others examined multiple topics or companies. It is worth noting that some case studies emphasize sustainable production, supply chain, or CSR rather than fashion organizations. Moreover, due to confidentiality and anonymity concerns, not all researchers disclosed the company or brand names in their article.

Out of all the case studies conducted on fashion companies and organizations, only 33 papers revealed the names of the companies. Among these, 23 papers focused on a single company, while 10 papers examined multiple companies, as illustrated in Table 4. The top four investigated companies over the 12-year period between 2010 and 2022 were H&M ($n = 8$), Inditex/Zara ($n = 6$), Gap Inc. ($n = 3$), and Nudie Jeans ($n = 3$). These findings suggest that a significant portion of previous case-study research primarily focused on Western fast-fashion companies. Interestingly, Fast Retailing in Japan was researched twice within the same period, apart from the Western fashion companies.

Table 4. Case study of single or multiple companies published from 2016 through 2021.

Company (Origin or Head Quarter)	Author(s)	Year
Case Studies of Single Company		
1. H&M (Sweden)	Javed et al. [48]	2020
2. H&M (Sweden)	Li et al. [49]	2014
3. H&M (Sweden)	Bonilla et al. [50]	2019
4. H&M (Sweden)	Shen [51]	2014
5. ZARA/Inditex (Spain)	Aftab et al. [52]	2018
6. ZARA/Inditex (Spain)	Gheorghe and Matefi [53]	2021
7. ZARA/Inditex (Spain)	Esbeih et al. [54]	2021
8. GAP Inc. (USA)	Arrigo [55]	2013
Case Studies of Multiple Companies		
1. Gap Inc. (USA), Levi's Co. (USA), H&M (Sweden), Benetton Group (Italy), Fast Retailing (Japan), E-land Group (South Korea)	Woo & Jin [56]	2016
2. H&M (Sweden) and ZARA (Spain)	Mo [57]	2015
3. H&M (Sweden), KappAhl (Sweden), Lindex (Germany), Gina Tricot (Sweden), Indiska (Sweden), Filippa K. (Sweden), Boomerang (Sweden), UFTD (Sweden), Nudie Jeans (The Netherlands)	Stål & Jansson [58]	2017
4. Zara (Spain), Gap Inc. (USA) & H&M (Sweden)	Arrigo [59]	2010

Note: Only the top 3 most investigated companies are listed in this table.

Based on these findings, it is reasonable to conclude that many case studies were designed to explore sustainable practices and development from the perspectives of fashion companies, particularly in the West. However, it is equally important to understand consumers' perspectives and perceptions when it comes to apparel shopping, buying, and consumption.

4.1.5. Prior Systematic Literature Review Papers

In addition to case study research, 34 "systematic literature review" papers were identified, as shown in Table 5. These papers were all published within the last eight years from 2014 to 2021. The topics covered in these papers include "sustainable development/practice" [5,60–62], "circular fashion/economy" [63–68], "recycling" [68,69], "retailing" [70], "life cycle" [63,71,72], "supply chain" [73–77], "sustainable fashion business" [78–80], "CSR" [81,82], "willingness to pay for sustainable apparel" [83], "reused-based clothing" [84], "fast fashion" [85], "pro-environmental behaviour" [86], and "collaborative consumption" [87,88]. Although several systematic literature review studies (as shown in Table 5) have examined the collective knowledge of sustainable practices in the fashion and textile industry, there has been limited investigation into "fashion, sustainability and consumption". Numerous researchers [89,90] have revealed the shifting landscape of the consumer market, highlighting a significant increase in socially and environmentally responsible consumption among younger consumers, including those from the Generation Z and Millennial segments. Therefore, it is important to identify the key sustainable trends to attain a deeper understanding of the role sustainable cues play in today's consumer market. Recognizing the limitations of previous research, the current study aims to enrich our understanding of fashion sustainability through a systematic literature review of recent journal publications, providing an updated and comprehensive analysis.

Table 5. Systematic literature review papers published from 2016 through 2021.

	Author(s)	Year	Journal Title	Paper Title
1.	Arrigo [87]	2021	*Journal of Cleaner Production*	Collaborative consumption in the fashion industry: A systematic literature review and conceptual framework
2.	de Aguiar Hugo et al. [63]	2021	*Sustainability*	Can Fashion Be Circular? A Literature Review on Circular Economy Barriers, Drivers, and Practices in the Fashion Industry's Productive Chain
3.	Fung et al. [73]	2021	*International Journal of Production Economics*	Sustainable product development processes in fashion—Supply chains structures and classifications
4.	Henninger et al. [91]	2021	*Journal of Cleaner Production*	Collaborative fashion consumption—A synthesis and future research agenda
5.	Hultberg and Pal [64]	2021	*Sustainable Production and Consumption*	Lessons on business model scalability for circular economy in the fashion retail value chain—towards a conceptual model
6.	Rotimi et al. [62]	2021	*Sustainability*	Towards a conceptual framework of sustainable practices of post-consumer textile waste at garment end of Lifecycle: A systematic literature review approach
7.	Islam et al. [5]	2021	*Journal of Fashion Marketing and Management*	Mapping environmentally sustainable practices in textiles, apparel and fashion industries: a systematic literature review
8.	Jutidamrongphan et al. [71]	2021	*Autex Research Journal*	Eco-fashion designing to ensure corporate social responsibility within the supply chain in fashion industry
9.	Liu et al. [60]	2021	*Environment, Development and Sustainability*	Microfiber pollution: an ongoing major environmental issue related to the sustainable development of textile and clothing industry
10.	Nguyen et al. [79]	2021	*Social Responsibility Journal*	Enhancing sustainability in the contemporary model of CSR: a case of fast fashion industry in developing countries
11.	Stention et al. [85]	2021	*Energies*	From Clothing Rations to Fast Fashion: Utilising Regenerated Protein Fibres to Alleviate Pressures on Mass Production

Table 5. *Cont.*

	Author(s)	Year	Journal Title	Paper Title
12.	Xie et al. [69]	2021	*Sustainability*	A Systematic Literature Review for the Recycling and Reuse of Wasted Clothing
13.	Ki et al. [66]	2020	*Corporate Social-responsibility and Environmental Management*	How fashion can achieve sustainable development through a circular economy and stakeholder engagement: A systematic literature review
14.	Luján-Ornelas et al. [72]	2020	*Sustainability*	A life cycle thinking approach to analyze sustainability in the textile Industry—A literature review
15.	Mukendi et al. [61]	2020	*European Journal of Marketing*	Sustainable fashion: current and future research directions
16.	Udall et al. [86]	2020	*Journal of Consumer Behaviour*	How do I see myself? A systematic review of identities in pro-environmental behaviour research
17.	Wagner and Heinzel [68]	2020	*Sustainability*	Human perceptions of recycled textiles and circular fashion: A systematic literature review
18.	Jia et al. [65]	2020	*Journal of Cleaner Production*	The circular economy in the textile and apparel industry: A systematic literature review
19.	Shirvanimoghaddam et al. [67]	2020	*Science of the Total Environment*	Death by waste: Fashion and textile circular economy case
20.	Luque and Herrero-Garcia [81]	2019	*Corporate Social-responsibility and Environmental Management*	How corporate social (ir)responsibility in the textile sector is defined, and its impact on ethical sustainability: An analysis of 133 concepts
21.	Nayak et al. [75]	2019	*Journal of Cleaner Production*	Recent sustainable trends in Vietnam's fashion supply chain
22.	Thorisdottir and Johannsdottir [80]	2019	*Sustainability*	Sustainability within fashion business models—A systematic literature review
23.	Becker-Leifhold and Iran [88]	2018	*Journal of Fashion Marketing and Management*	Collaborative fashion consumption—drivers, barriers and future pathways
24.	Desore and Narula [92]	2018	*Environment, Development and Sustainability*	Microfiber pollution: an ongoing major environmental issue related to the sustainable development of textile and clothing industry
25.	Paras and Curteza [93]	2018	*Research Journal of Textile and Apparel*	Revisiting upcycling phenomena: a concept in clothing industry
26.	Paras et al. [84]	2018	*The International Review of Retail, Distribution and Consumer Research*	Systematic literature review to develop a conceptual framework for a reuse-based clothing value chain
27.	Tey et al. [83]	2018	*Journal of Global Fashion Marketing*	Factors influencing willingness to pay for sustainable apparel: A literature review
28.	Rafi-Ul-Shan et al. [76]	2018	*International Journal of Retail & Distribution Management*	Relationship between sustainability and risk management in fashion supply chains: A systematic literature review
29.	Sirilertsuwan et al. [77]	2018	*The International Journal of Logistics Management*	Proximity manufacturing for enhancing clothing supply chain sustainability
30.	Aftab et al. [52]	2017	*International Journal of Business and Management.*	Postponement Application in the Fast Fashion Supply Chain: A Review
31.	Köksal et al. [74]	2017	*Sustainability*	Social Sustainable Supply Chain Management in the Textile and Apparel Industry—A Literature Review
32.	White et al. [82]	2017	*Corporate Social-responsibility and Environmental Management*	CSR research in the apparel industry: A quantitative and qualitative review of existing literature
33.	Yang et al. [70]	2017b	*Sustainability*	Sustainable retailing in the fashion industry: A systematic literature review
34.	Hakan et al. [78]	2016	*Sustainability*	From a Systematic Literature Review to a Classification Framework: Sustainability Integration in Fashion Operations

4.1.6. Geographic Information

To comprehensively understand the global distribution of research on "fashion and sustainability", it is imperative to review both the affiliation of the lead author and the geographic location where the research was conducted. In certain cases, the first author may be affiliated with an institution in North America, while the study itself was conducted in Asia. This review aims to document the location of the research study and the number of publications by country and region, with the primary objectives being to identify current research trends, assess the geographic distribution of studies, and pinpoint research gaps.

In terms of the country affiliation of the first author, the majority of previous studies were led by researchers from the United States ($n = 241$), followed by the United Kingdom ($n = 102$), China including Hong Kong ($n = 75$), South Korea ($n = 55$), Germany ($n = 38$), Italy ($n = 40$), and Sweden ($n = 36$). As depicted in Figure 6, recent research has predominantly been led by researchers affiliated with European institutions ($n = 328$) and North American institutions ($n = 262$). In contrast, there have been a smaller number of studies led by researchers in Asia ($n = 190$), Oceania ($n = 39$), the Middle East ($n = 17$), South America ($n = 16$), and Africa ($n = 8$) from the period 2010 to 2021.
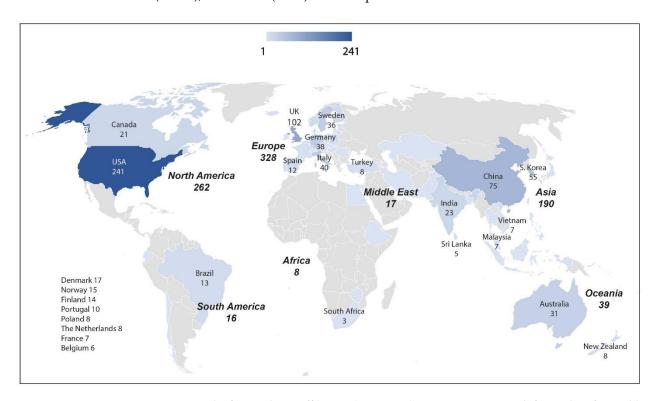

Figure 6. The first author's affiliation (2010–2021). Many countries with fewer than five publications are not indicated on this map.

As discussed in the previous section, it is important to note that even if authors are affiliated with Western institutions, their research might not necessarily be conducted in Western societies. This indicates that relying solely on the author's affiliation may not yield accurate information about the research location. In addition to the geographic focus, the current investigation also examined the gender distribution of previous research. Moreover, it is worth mentioning that certain articles collected for this study, such as literature reviews, conceptual-based research, or mathematical models, do not focus on any country or region. Therefore, these studies are not included in this section.

In total, 787 primary research studies were conducted in 65 countries. Among these 787 papers, 79 are cross-national/-cultural ("cross-national" is used hereafter) studies, with 62 papers focusing on multiple countries and 17 papers focusing on a single or multiple region(s)/continent(s) (e.g., Southeast Asia, Scandinavia, EU, West Africa, Europe, and

North America). In the case of a study conducted in five different nations, the study was counted five times based on its geographic focus. Therefore, it is important to note that the data presented in Figure 7 do not refer to the number of papers but rather the number of published research papers conducted in each country from 2010 through 2021. As summarized in Figure 7, the results align with the author's affiliation. The United States had the highest number of studies with 254, followed by the United Kingdom (*n* = 90), China (*n* = 81), South Korea (*n* = 60), Sweden (*n* = 47), Germany (*n* = 46), and Italy (*n* = 45). In terms of human subject recruitment, 217 papers (including 190 quantitative and 27 qualitative studies) focused more on females (if over 50% of the participants were females); 42 papers were male-oriented; 81 exclusively focused on females; 3 solely focused on males; and 13 had a 50/50 split (as shown in Table 6). This observation indicated that the majority of "fashion and sustainability" research is concentrated on females, consistent with many previous apparel studies [46,94,95]. Overall, women tend to display relatively higher interest in fashion compared to their male counterparts.
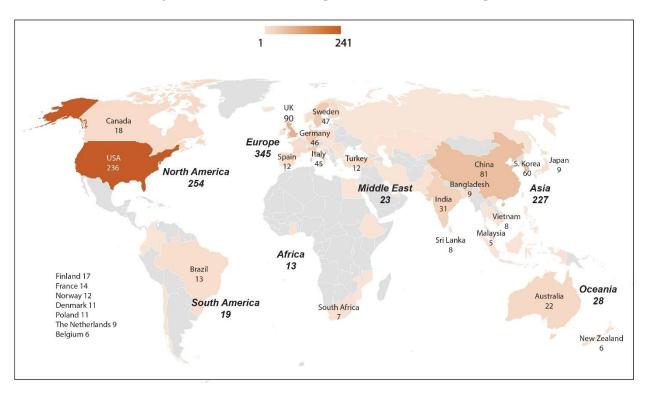

Figure 7. The geographic location of the research study (2010–2021). Many countries with fewer than five publications are not indicated on this map.

Table 6. Research involving human participants (2010–2021).

Gender/Sexual Orientation of Participants (Number of Paper)	Frequency
50/50 split of gender distribution	13
Only female participants	81
Over 50% were female participants:	217
Studies with more than 55% of female participants	185
The gender distribution is almost the same—less than 5% difference	32
Only male participants	3
Over 50% were male participants	42
Studies with more than 55% of male participants	29
The gender distribution is almost the same—less than 5% difference	13

A total of 79 cross-national papers were identified from the dataset. Among these papers, 17 focused on a single region with multiple countries or multiple regions without

disclosing the names or the number of countries investigated. Table 7 provides a summary of these studies, revealing that the majority of cross-national research focused on two (*n* = 33) or three (*n* = 14) countries. Of these, six papers examined differences between South Korea and the United States, while five papers explored differences between China and the United States.

Table 7. Cross-nation/-cultural research papers (2010–2021).

Countries (Number of Study: *n* = 62)	Geographic Focus	No. of Countries	Citation	Topic
China and S. Korea (2)	Asia	2	1. Jung and Oh [96] 2. Wang et al. [97]	1. Sustainability concepts—leather apparel. 2. Sustainable fashion.
Bangladesh, India, and Vietnam (1)	Asia	3	Saha et al. [98]	Circular economy
S. Korea, China, and Japan (1)	Asia	3	Kong and Ko [99]	Consumer choice—sustainable fashion
China, Bangladesh, India, Turkey, and Cambodia (1)	Asia	5	Repp et al. [100]	Circular economy
Belgium and Ireland (2)	Europe	2	1. Caro and Gallien [101] 2. Caro and Gallien [102]	1. Fast fashion. 2. Fast fashion.
Italy and France (1)	Europe	2	Battaglia et al. [103]	CSR
Poland, France, and Spain (1)	Europe	3	Grębosz-Krawczyk and Siuda [104]	Attitudes of consumers toward recycling
USA, UK, and Switzerland (1)	Europe	3	Weiss et al. [105]	Sustainable fashion
Sweden, Denmark, and Estonia (1)	Europe	3	Farrant et al. [106]	Reusing clothes
UK, Finland, and Germany (1)	Europe	3	Henninger et al. [107]	Fashion swapping
Germany, Italy, and UK (1)	Europe	3	Norris [108]	Circular economy
Denmark, Norway, Sweden, Finland, and Iceland (1)	Europe	5	Pedersen and Gwozdz [109]	CSR
Germany, UK, France, Norway, and Sweden (1)	Europe	5	Austgulen [110]	Sustainable textile consumption
Italy and China (1)	Asia and Europe	2	Lan and Zhu [111]	Fast fashion
UK and Turkey (1)	Asia and Europe	2	Tokatli et al. [112]	Fast fashion
Germany and S. Korea (1)	Asia and Europe	2	Kong et al. [113]	Sustainability and social media communication
S. Korea and UK (1)	Asia and Europe	2	Kim et al. [114]	Textile recycling systems
S. Korea and Spain (1)	Asia and Europe	2	Yoon et al. [115]	Corporate sustainability
Turkey and Kazakhstan (1)	Asia and Europe	2	Şener et al. [116]	Slow fashion
Bangladesh, India, and Estonia (1)	Asia and Europe	3	Aus et al. [117]	Circular fashion
The Netherlands and China (1)	Asia and Europe	3	Almanza and Corona [118]	Social life cycle assessment—sustainable development
France, Germany, and China (1)	Asia and Europe	3	Wagner et al. [119]	Eco-fashion style
Japan, UK, and Italy (1)	Asia and Europe	3	Goworek [120]	Fair trade retailer

Table 7. *Cont.*

Countries (Number of Study: *n* = 62)	Geographic Focus	No. of Countries	Citation	Topic
China and USA (6)	Asia and N. America	2	1. Lee et al. [121] 2. Shen et al. [51] 3. Su et al. [122] 4. Lee and Huang [123] 5. Lang et al. [124] 6. Ko and Jin [125]	1. Corporate sustainability. 2. Economic sustainability. 3. Sustainable clothing. 4. Fashion renting. 5. Fashion renting. 6. Purchase intention of green apparel.
USA and S. Korea (6)	Asia and N. America	2	1. Lee and DeLong [126] 2. DeLong et al. [127] 3. Workman et al. [128] 4. Han [129] 5. DeLong et al. [130] 6. Ramkumar et al. [131]	1. Handcraft apparel. 2. Education for fashion sustainability. 3. Pro-environmental behaviour. 4. Organic cotton apparel purchase. 5. Sustainable clothing. 6. Circular fashion services.
Hong Kong and Canada (1)	Asia and N. America	2	Joy et al. [132]	Fast fashion
Canada and India (1)	Asia and N. America	2	Rahman et al. [2]	Consumer choice—apparel and sustainable cues
USA and Sri Lanka (1)	Asia and N. America	2	Clarke-Sather and Cobb [133]	Onshoring fashion
USA, India, China, and S. Korea (1)	Asia and N. America	4	Pan et al. [134]	Fashion thinking fashion practices
USA and Finland (1)	Europe and N. America	2	Hirscher et al. [135]	Social manufacturing in fashion
Poland and Canada (1)	Europe and N. America	2	Malgorzata et al. [136]	Circular fashion
Monaco and Canada (1)	Europe and N. America	2	Cervellon and Carey [137]	Consumers' perceptions of 'green'
Finland and USA (1)	Europe and N. America	2	Armstrong et al. [138]	Sustainable clothing consumption
UK, France, and Canada (1)	Europe and N. America	3	Carey and Cervellon [139]	Ethical fashion
USA, Germany, Sweden, and Poland (3)	Europe and N. America	4	1. Joanes [140] 2. Sohn et al. [141] 3. Gwozdz et al. [142]	1. Reduced fashion consumption. 2. The environmental impacts of fashion. 3. clothing consumption.
Sweden, the Netherlands, Germany UK, and USA (1)	Europe and N. America	4	Gupta et al. [143]	Sustainable apparel consumption
Germany, Poland, Sweden, USA, and UK (1)	Europe and N. America	5	Joanes et al. [144]	Reducing personal consumption
Scotland (UK) and Australia (1)	Europe and Oceania	2	Bianchi and Birtwistle [145]	Disposal behaviour
Germany and Iran (1)	Europe and Middle East	2	Iran et al. [146]	Collaborative fashion consumption
Germany and Ethiopia (1)	Europe and Africa	2	Warasthe et al. [147]	Sustainability—textile and apparel supply chain

Table 7. *Cont.*

Countries (Number of Study: *n* = 62)	Geographic Focus	No. of Countries	Citation	Topic
UK, USA, and China (1)	Asia, Europe, and N. America	3	Jung et al. [148]	Sustainable apparel product
USA, Canada, S. Korea, and Sweden (1)	Asia, Europe, and N. America	4	Choi and Han [149]	Green innovation
Brazil, Russia, India, and China (1)	Asia, Europe, and S. America	4	Mair et al. [150]	Fairness in global supply chain
India, Dubai (UAE), and USA (1)	Asia, N. America, and Middle East	3	Patwa and Seetharaman [151]	Redesigning fashion industry—circular approach
Germany, USA, UK, Denmark, Italy, Sweden, Switzerland, Finland, the Netherlands, Brazil, Bulgaria, and France (1)	Europe, N. America, and S. America	12	Adam [152]	Sustainable product-service systems (PSS)
Chile, USA, France, Germany, and Lebanon (1)	Europe, S. America, and Middle East	5	Dickenbrok and Martinez [153]	Communicating green fashion
China, Japan, S. Korea, USA, Singapore, UK, and Australia (1)	Asia, Europe, N. America,, and Oceania	7	Kim [154]	Collaborative fashion consumption
Pakistan, Malaysia, Spain, Saudi Arabia, USA, India, UK, Sweden, and China (1)	Asia, Europe, N. America, and Middle East	9	Ahmad et al. [155]	Sustainable textile and apparel industry

The distribution of the studies across regions is as follows: fifteen papers were conducted in "Asia and North America" (*n* = 16), followed by "Europe and North America" (*n* = 10), "Asia and Europe" (*n* = 10), and "Europe with multiple nations" (*n* = 10). Moreover, only eight papers were conducted in multiple countries across three to four continents. The possible explanations for this pattern may include language barrier, cultural differences, research complexities, and moral and ethical considerations.

Notably, a higher number of studies were conducted in Western nations compared to Eastern nations, excluding China and South Korea. The empirical research conducted in Africa or South America was minimal, as indicated in Figure 7. Western researchers/institutions led more than half of the cross-national studies (*n* = 49.79%) aligning with the information presented in Figures 6 and 7. It is important to mention that these 49 papers do not include studies that did not specify the names of the countries investigated.

4.2. Stage 2—Findings

4.2.1. Identification of Consumer Research Papers

After selecting 280 relevant papers, they were categorized into two main groups—"consumer behaviour" (more related to consumer behaviour or micro-level) and "fashion sustainability" (more related to sustainable practices or macro-level)—with various sub-groups based on the occurrences of the keywords and phrases in the titles. In cases where the titles contained multiple keywords or phrases, the papers were placed in multiple sub-groups. For instance, a study on the "attitude and behaviour gap" was categorized into "attitude" and "behaviour" sub-groups.

The sub-groups in the "consumer behaviour" category included studies on consumer behaviour, perceptions, attitudes, motivations, intention, awareness, value, choice, preference, and knowledge, while the "fashion sustainability' category covered topics such as collaborative consumption, sharing economy, and fast and slow fashion, among others. As indicated in Figure 8, some of the sub-groups have similar meanings and concepts. For example, the sub-groups of collaborative consumption, fashion sharing, and clothes swapping or the sub-groups of clothes reuses and fashion rental were similar in terms of their concepts.
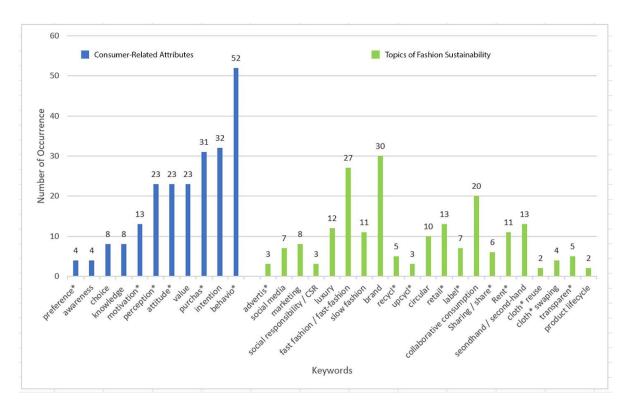
Figure 8. Key topics identified from the titles of 280 "Consumer" papers. * The truncation/wildcard symbol is used to search for the root of a word, including alternative word forms or plurals.

According to the findings, many studies were focused on consumer behaviour ($n = 52$), followed by consumer purchases ($n = 32$), consumer intention ($n = 31$), fast fashion ($n = 30$), and fashion brand ($n = 27$). The results of this systematic literature review not only provide an overview of research trends but also shed lights on potential research areas for future investigation. For example, future research could focus on exploring consumers' awareness and knowledge regarding fashion swapping, as these areas are relatively under-researched compared to other aspects of consumer behaviour and fashion sustainability.

4.2.2. Bibliometric Analysis Using Visualization Tools

Bibliometrics is a statistical method to quantitatively analyze a research topic. It is particularly useful for the examining a large number of publications [156] and mitigating potential biases [157]. To facilitate analysis and visual mapping, search results from Web of Science (WoS) can be exported to many types of visualization software such as VOSviewer 1.6.19, Pajek 5.17, HistCite, Citespace 5.7.R2, RStudio 1.4, SciMAT, or CitNetExplorer 7. Employing bibliometric analysis offers numerous benefits, including the ability to (1) identify influential or seminal papers within a topic, (2) trace the genealogy of a specific field of study to unveil the current research streams and emerging streams, (3) depict the geographical scope and research approaches employed, (4) identify frequently used research theories and methods, (5) highlight research trends and major contributors such as leading scholars, journals, and academic institutions, and (6) predict and recommend future research directions.

While a considerable number of studies have explored the concept of "fashion sustainability", none of them have utilize VOSviewer and CitNetExplorer for conducting bibliometric analysis and data mapping. In order to gain a comprehensive understanding and establish research directions in the field of "fashion and sustainability", we exported the plain text data file, which comprised 280 literature sources obtained after the second round of screening, to VOSviewer and CitNetExplorer software for conducting bibliometric analysis. It is important to note that bibliometric analysis does not replace systematic literature review; instead, it serves to complement it and to provide a comprehensive

overview of the focused topic [158]. VOSviewer and CitNetExplorer were selected for this study because they are freely available, offer user-friendly interfaces, have the ability to generate relational networks among the literature within a specific field, and can analyze the evolution paths and trends to show the changes over different time periods. These two programs are particularly useful for generating visualization bibliometric maps, thus facilitating the comprehension of data interpretation.

4.2.3. VOSviewer Analysis—Co-Occurrences of Keywords

The bibliographic data were utilized to generate a visual map to illustrate the co-occurrence of all keywords in VOSviewer. All keywords, including the word occurrence in the article title, author keywords, and abstract, are considered. During the operational process, full counting was employed, and the minimum of keyword occurrence was set at 10. Out of 306 keywords, 123 met the threshold, and the network visualization map consisting of four clusters was generated as depicted in Figure 9. The size of letters and circles in the map reflects the frequency of keyword occurrence, with larger sizes indicating a higher frequency. Similarly, the thickness of the curve lines in the map corresponds to the total strength of the links, where thicker lines signify stronger connections.
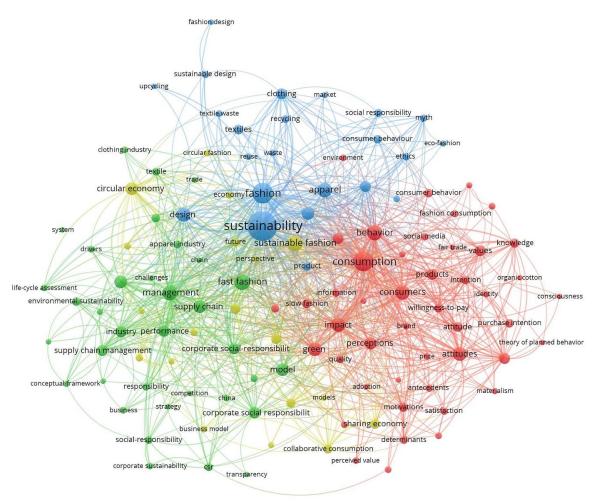

Figure 9. Network visualization of co-citation.

In Figure 9, the results were grouped into four clusters, each represented by differently coloured circles. Cluster 1 is depicted in red containing 46 items; cluster 2 is represented in green and includes 35 items; cluster 3 is shown in blue and consists of 23 items, while cluster 4 is displayed in mustard with 19 items. For example, cluster 1 is depicted in red, and the circle's size indicates the frequency of keyword occurrences. In cluster 1, the

keyword "consumption" has the highest frequency with 128 occurrences and is linked to 113 other terms. As a result, the circle representing "consumption" is the largest in size and is connected to many smaller circles such as "behaviour", "consumers", "consumer behaviour", "attitude", "motivations", "perceptions", and "products". It is worth noting that keywords in cluster 1 may also link to keywords in other clusters. The co-linkages among the keywords generate the network visualization map shown in Figure 10. Strong co-linkages result in keywords being positioned in close proximity to each other with shorter curve lines. These findings are similar to Figure 8. However, the results of Figure 9 are solely derived from the article titles rather than from three different sources (article title, author keywords, and abstract) as Figure 10.
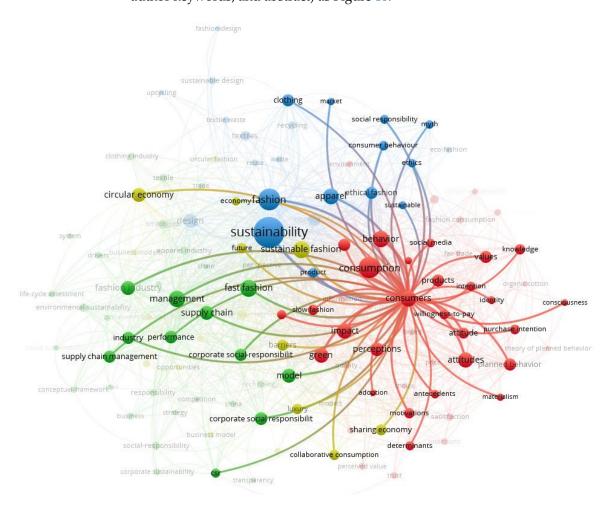

Figure 10. Network visualization of cluster 1 co-citation.

4.2.4. VOSviewer Analysis—Academic Organization

In addition to visualizing the co-occurrence of keywords, the co-authorship network among authors and organizations was analyzed to identify the major contributors. To establish the selection parameter and operational process, the minimum number of documents and citations of an organization was set at 5 and 0, respectively. Out of 657 organizations, 49 met the threshold, resulting in a network visualization comprising 11 clusters, 69 links, and a total link strength of 125. This analysis offers valuable insights and serves as a useful reference for researchers in the field of "sustainability, fashion and consumption" by highlighting the prominent global contributors. The ranking of organizations was based on their total link strength scores. As presented in Figure 11 and Table 8, Hong Kong Polytechnic University was ranked the first, followed by Oklahoma State University, Seoul National University, the University of Minnesota, and Louisiana State University. In cluster 2, the Hong Kong Polytechnic University connects to seven universities including City

University of Hong Kong (China), the University of North Carolina (USA), Texas Tech University (USA), the University of Missouri (USA), Kent State University (USA), Donghua University (China), and Seoul National University (South Korea).
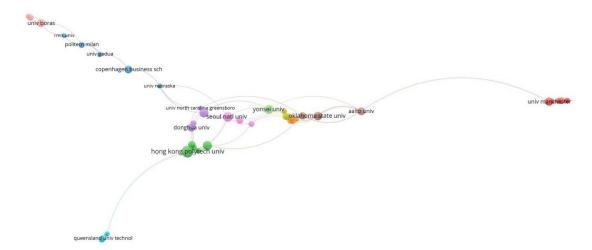

Figure 11. Network visualization of co-authorship among organizations.

Table 8. The top 15 organizations.

Organization (Country)	Documents	Citations	Total Link Strength
Hong Kong Polytechnic University (Hong Kong, China)	31	1420	18
Oklahoma State University (Stillwater, OK, USA)	17	677	17
Seoul National University (Seoul, Republic of Korea)	20	309	16
University of Minnesota (Minneapolis, MN, USA)	19	213	14
Louisiana State University (Baton Rouge, LA, USA)	12	321	12
University of Borås (Borås, Sweden)	15	312	12
Soochow University (Suzhou, China)	10	181	11
University of Missouri (Columbia, MO, USA)	19	227	10
Iowa State University (Ames, IA, USA)	11	216	9
Yonsei University (Seoul, Republic of Korea)	19	444	9
Aalto University (Espoo, Finland)	13	896	8
Illinois State University (Normal, IL, USA)	11	323	8
University of Manchester (Manchester, UK)	15	576	7
Donghua University (Shanghai, China)	15	695	6
Politecnico Milano University (Milan, Italy)	8	655	6

4.2.5. VOSviewer—Co-Citation Mapping Analysis

In this study, co-citation analysis provides valuable information on key publications, citation relationships between publications, and authors in the area of "sustainability, fashion and consumption" based on the citations. As Guleria and Kaur [158] stated in their article, "A co-citation link is a link between two items that are both cited by the

same document". To conduct the mapping analysis, the minimum number of citations of a cited reference was set as 20. In other words, any references that have fewer than 20 citations were not selected for analysis. Among the 29,147 cited references, 120 met the threshold. Figure 12 illustrates the mapping results, where each circle represents the first author's name and publication year of a paper. The size and colour of the circles indicate the citation weight and cluster, respectively. Circles of the same colour belong to the same cluster. Notably, Joergen's paper [159] published in the *Journal of Fashion Marketing and Management* holds the highest total length strength of 1040, followed by Niinimäki [160] and Joy et al. [132] (see Table 9 for the top 10 papers). In total, five clusters were generated and visually distinguished by different colours. For example, within the green cluster, Fletcher (2008) [161] emerged as a significant co-cited item, being linked to 115 other items.
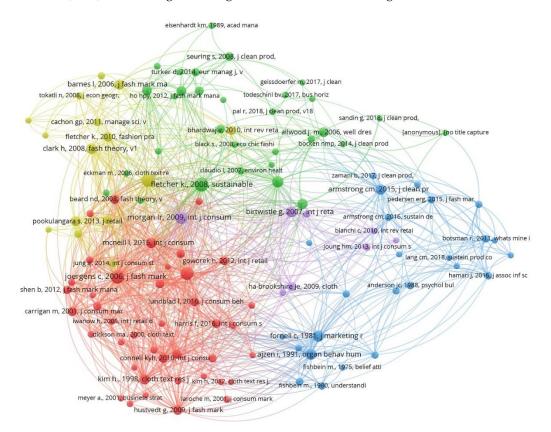

Figure 12. Network visualization analysis of co-citation between publications.

Table 9. Top 10 papers.

Cited Reference	Citations	Total Link Strength
Joergen C. (2006) [159], *Journal of Fashion Marketing and Management*	92	1040
Niinimäki K. (2010) [160], *Sustainable Development*	87	979
Joy, A. (2012) [132], *Fashion Theory*	96	860
Fletcher, K. (2008) [161], *Sustainable Fashion*	101	818
Morgan, L.R. (2009) [162], *International Journal of Consumer Studies*	79	757
Kim, H. (1998) [163], *Clothing and Textiles Research Journal*	59	655
Niinimäki K. (2011) [164], *Journal of Cleaner Production*	68	645
McNeill, L. (2015) [165], *International Journal of Consumer Studies*	58	612
Birtwistle, G. (2007) [166], *International Journal of Retail & Distribution*	60	605
Connell, K.Y.H. (2010) [167], *International Journal of Consumer Studies*	52	600

4.2.6. CitNetExplorer Analysis—Chronological Citation Chart

In addition to VOSviewer, another visualization tool called "CitNetExplorer" was employed to examine the development trends and evolution paths, assisting researchers in predicting the future directions of development. CitNetExplorer, short for "Citation Network Explorer", is an open-source bibliometric tool developed by the Centre for Science and Technology Studies at the University of Leiden in the Netherlands. Figure 13 depicted the citation relationships among the literature, illustrating the transmission and development of knowledge pertaining to "sustainability, fashion and consumption". The analysis was conducted using the defaulted parameter, which included a maximum of 10 publications per layer and a minimum distance of five between publications. However, it is important to mention that CitNetExplorer was set to its default configuration, which displays only the 40 most frequently cited publications, as visualizing all 1108 publications within a single chronological chart is impractical. These 40 publications are labelled using the last name of the first author. As shown in Figure 13, out of all 40 frequently cited publications, only one of them was published in the 1980s. The first author of this article is Fornell, and it was published in the *Journal of Marketing Research* [168]. Moving into the 1990s, the number of frequently cited publications increased to three. These include Ajzen's seminal paper [169] titled "The Theory of Planned Behaviour" published in *Organizational Behaviour and Human Decision*, as well as Butler and Francis's [170] and Kim and Damhorst's [163] publications, both featured in the *Clothing and Textiles Research Journal*. It is evident that the number of citations and citation-linkages has increased drastically since 2000. This finding also provides support to the preceding discussions, that people pay more attention to the topic of "sustainability, fashion and consumption", including academicians.
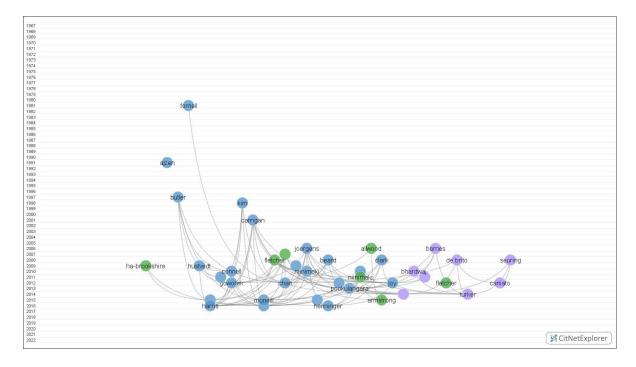

Figure 13. Chronological flow chart of publications.

5. Conclusions and Implications

To reiterate, the present study focuses on three key areas: sustainability, fashion, and consumption. It explores the shopping, selecting, and purchasing behaviours of fashion consumers through a systematic literature review, complemented by visualization tools. In this study, both VOSviewer and CitNetExplorer were employed to analyze and visualize the citation networks, including clustering the publications based on their citation relations.

5.1. Research Trends, Development, and Areas of Improvement

The information presented in Figure 3 clearly indicates an upward trend in the number of publications pertaining to "fashion and sustainability" since 2010. Out of the 860 publications identified in this particular field, approximately 30% were published in three specific journals: *Sustainability*, *Journal of Fashion Marketing and Management*, and *Journal of Cleaner Production*. Based on the findings presented in Figure 8, this literature review has identified several research areas that have garnered comparatively more attention than others. These prominent areas include consumer behaviour, purchasing intentions, fast fashion, brand and sustainability, collaborative consumption, and second-hand clothing. Apart from the publications in both fashion and sustainability journals, it is evident that some papers were published in various fields beyond fashion or sustainability, including *The Journal of Modern Craft*, *Mobile Networks and Applications*, *Journal of Language and Politics*, *International Journal of Advertising*, *Current Anthropology*, *Australian Feminist Studies*, and *Laws*. This observation indicates a growing trend of interdisciplinary research that explores the intersection of fashion, sustainability, and other critical issues from a unique and varied perspective.

5.1.1. Case Study

Among the publications, 93 were case studies, while 35 were systematic literature reviews. It is worth noting that during the period from 2010 to 2021, H&M, Zara, and The Gap emerged as the most extensively studied companies in the case studies. These multinational retailers, recognized as fast fashion companies, play a significant role in the consumer market and have a substantial impact on the global environment. As a result, there is considerable interest among both the public and academic researchers to understand their evolving business models, company policies, operational strategies, and sustainability initiatives.

While studying large corporations is indeed crucial, it is equally important to acknowledge the significant role that small and medium enterprises (SMEs) play in the global economy, especially in developing or emerging nations. According to the World Bank (2023), SMEs "represent about 90% of business and more than 50% of employment worldwide". Therefore, conducting research on companies of smaller scale, including micro-sized businesses, startups, and non-profit organizations (NPOs), becomes imperative. Such research enables us to gain valuable insight into their unique business structures and the specific challenges they face. It is essential to understand the role these companies can play and the obstacles they encounter within today's fast-changing economy.

5.1.2. Gender Distribution and Orientations

As depicted in Table 6, a significant portion of the existing research has exclusively focused on female participants or displayed a bias towards women. Although female consumers have shown relatively higher involvement and interest in fashion, it is vital to understand the cognitive and affective processes, as well as the buying behaviours of men in relation to clothing consumption. Prior studies [171,172] have reported that men have become increasingly concerned about their physical appearance and have shown a heightened interest in personal grooming. As reported by Newman [173] in The New York Times, the expenditure on grooming products for men in the United States experienced a twofold increase, reaching USD 4.6 billion between 1997 and 2009. Additionally, there is significant dearth of information regarding the buying behaviour of other gender identities, such as LGBTQ+ individuals, indicating a crucial gap that required attention and further investigation.

5.1.3. Geographic Scope of Research Studies

As illustrated in Figure 7, most research studies were conducted across three continents: Europe (*n* = 345), North America (*n* = 254), and Asia (*n* = 227). The highest concentration of research was carried out in the United States (*n* = 236), followed by the United Kingdom

(n = 90), China (n = 81), South Korea (n = 60), Sweden (n = 47), Germany (n = 46), and Italy (n = 46). Figure 14 illustrates the substantial growth in the number of publications in China, South Korea, and India from 2010 to 2021, with a notable increase observed after 2013. However, when compared to the United States and the United Kingdom, the overall volume of publications in these countries remains relatively low. According to the United Nations (2022), Asia has the largest global population, accounting for 59.4%, followed by Africa (17.6%), Europe (9.4%), and North America (7.5%). Despite Asia and Africa having the highest population of consumers, the number of research studies conducted in these regions is relatively low compared to North America and Europe. This indicates an imbalance in the proportion of studies relative to population ratios.
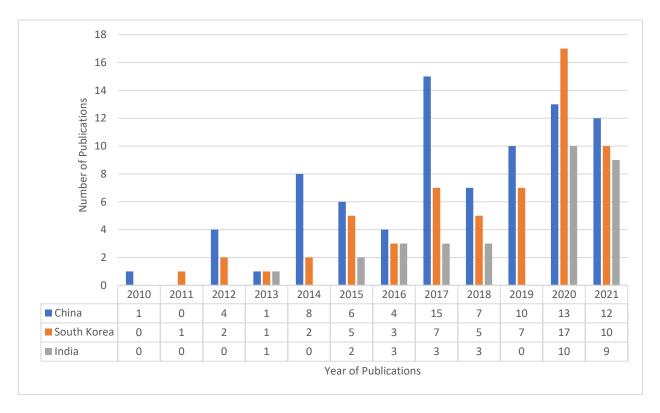

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
China	1	0	4	1	8	6	4	15	7	10	13	12
South Korea	0	1	2	1	2	5	3	7	5	7	17	10
India	0	0	0	1	0	2	3	3	3	0	10	9

Figure 14. Publication trends in China, South Korea, and India.

In summary, the findings reveal notable research trends and advancements in the field of fashion and sustainability between 2010 and 2021. Although the United States and Europe exhibit a higher number of publications during this period, it is noteworthy that several academic institutions in Asia, including three in China (Hong Kong Polytechnic University, Soochow University, and Donghua University) and two in South Korea (Seoul National University and Yonsei University), have also made significant contribution to the field (as shown in Table 8).

5.1.4. Cross-National Research Studies

Out of the 860 publications in the dataset, 79 were identified as cross-national research studies. Among these 79 papers, only 62 provided the names of the countries investigated, while the remaining papers referred to regions or continents without specifying all the countries involved. As presented in Table 7, the countries that were more frequently investigated in a cross-national context included the United States (n = 29), China (n = 19), South Korea (n = 15), the United Kingdom (n = 15), Germany (n = 14), and Sweden (n = 11). This analysis unveils that many countries in the Middle East, South America, Africa, and Asia have been under-researched and have received little attention in cross-national investigations. Although conducting research in the two largest consumer markets (the

United States and China) is crucial to provide insights to fashion practitioners, it is equally important to understand "fashion and sustainability" in other nations such as India and Vietnam. In 2022, India experienced a robust growth rate of 8.7% (Forbes India, 2023) [174], while Vietnam experienced a growth rate of 8.02% (Vu, 2022) [175].

5.1.5. Apparel Product Cues

Although this study primarily focuses on "fashion, sustainability and consumption", there has been a relatively limited amount of research that incorporates sustainable cues such as "clean production" compared to studies that emphasize non-sustainable cues such as aesthetic and functional benefits [176,177] in their investigations. As shown in Table 1, the non-sustainable cues such as style (n = 71), price (n = 63), quality (n = 58), and fabric (n = 56) were more frequently investigated than the sustainable cues such as less energy usage (n = 47), less water usage (n = 41), and certified sustainable labels (n = 41). Interestingly, within the domain of sustainable cues, a greater number of studies have focused on environmental-related cues rather than social/ethical-related cues (such as the absence of child labour, fair wages, workers' safety, and avoidance of animal skin usage). To enhance our understanding of the effects of socially responsible practices, additional research is needed.

5.2. Implications of Network Visualization Mapping

According to Meho [178] (p. 1), citation analysis can be described as "a branch of information science in which researchers study the way articles in a scholarly field are accessed and referenced by others". The results of citation analysis can offer researchers valuable insights into influential papers, prominent organizations, and prolific researchers within the field. Many researchers have underscored the effectiveness of citation analysis in demonstrating the impact of scholarly research. For example, in a case study, Gooden (2001) [179] pointed out that "citation analysis is an excellent unobtrusive method to determine which resources doctoral students [or scholars] are using". This method offers valuable information, including the volume of publications in a specific area, citation patterns, and authorship. Furthermore, co-citation analysis was conducted to identify frequently cited publications, uncover key publication topics and dissemination venues, and reveal the interdisciplinary nature of research disciplines. Co-citation refers to the frequency with which two publications are cited together by other works [180].

Regarding the co-occurrence of all keywords, VOSviewer generated four clusters (see Figure 9 for keyword grouping). The formation of each cluster was determined by the relatedness of the keywords. In simple terms, each cluster consists of a specific number of related keywords and would be presented in the same colour. Although some similar keywords appear in multiple clusters, each cluster can be categorized into and labelled with different themes. Cluster 1 was labelled as "fashion consumers" due to the frequent occurrence of keywords associated with consumer behaviour, attitudes, perceptions, motivations, knowledge, decision-making, and buying intention. Cluster 2 comprises keywords such as corporate social responsibility (CSR), social sustainability, supply chain, retail, and fast fashion and was designated as "corporation strategies". Cluster 3, labelled as "fashion products", consists of keywords such as product, design, fashion design, sustainable design, recycling, reuse, and textile waste. The final cluster, labelled as "business model", encompasses keywords such as sustainable business model, circular economy, sharing economy, and collaborative consumption. Based on these categorizations, it is reasonable to suggest that there are four key research themes related to the topic of "fashion, sustainability and consumption": fashion consumers, corporate social responsibility, fashion products, and business model.

According to the findings, it is apparent that numerous research studies, e.g., [181,182], focusing on "fashion consumer" in cluster 1 employed the Theory of Planned Behaviour (TPB) for their investigation. This finding offers a plausible explanation for the frequent citations of Ajzen's [169] seminal paper titled "The Theory of Planned Behaviour", as

depicted in Figure 13. In addition, it is noteworthy to mention that among all the TPB papers, half of them utilized Structural Equation Modelling (SEM) as their analytical approach. This finding helps to explain the frequent citations of Fornell and Larcker's [168] publication titled "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error" over the years, as depicted in Figure 13. While Fornell and Larcker's [168] and Ajzen's [169] publications may not have direct relevance to fashion and sustainability, they offer valuable contributions in terms of theory and analytical approach that can be applied in various disciplines, such as consumer research and fashion studies. As a result, these publications play a significant role in fostering future advancements in these fields.

In a similar vein, due to their different research topic, numerous studies, e.g., [141,183,184], within cluster 2 employed Life Cycle Assessment (LCA) to investigate various facets of sustainability (e.g., sustainable development goals and end-of-life management) and specifically assess the environmental impacts associated with apparel industry and clothing.

6. Limitations and Direction for Future Research

The current study offers valuable insights into fashion consumption and sustainability, providing practical information for fashion practitioners. It enhances their ability to identify and target appropriate market segments, offer relevant products to satisfy changing consumers' needs, and deliver effective messages to both existing and potential customers. Moreover, additional information about the study can be provided upon request.

Although this study makes valuable contributions, it is important to emphasize that it also has several limitations and shortcomings that should be acknowledged.

Firstly, the data collected for this study were confined to the period between 2010 and 2021, thereby limiting our understanding of the longer-term evolution of research development. Conducting additional research with a broader timeframe may yield a more comprehensive understanding of the subject matter.

Secondly, it is worth noting that this study exclusively focused on apparel products. Therefore, conducting research on consumer behaviour and practices in other product types or services, such as electric vehicles, LED bulbs, and bike sharing, would be beneficial in providing a more comprehensive and holistic perspective on the topic of sustainable consumption.

Thirdly, given the specific focus of the present study, the perspectives of fashion practitioners were not explored. Therefore, it would be useful to gain insight into how fashion designers, manufacturers, retailers, and marketers use various apparel product cues throughout the entire processes, including product design, prototype development, and green marketing. By conducting such research, it will contribute to a better understanding of whether practitioners attribute similar significance to product cues as consumers do when making decisions.

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