# THE CONCEPT OF SUSTAINABLE FASHION FROM PAST TO PRESENT: A BIBLIOMETRIC APPROACH ON THE BASIS OF PRE-COVID DATA

*Aygul Donmez-Turan *(Orcid ID: 0000-0002-6431-3247)*
*Ayten Bahceli *(Orcid ID: 0009-0006-6759-313X)*
*Yıldız Ceren Cakmak *(Orcid ID: 0009-0001-7314-2857)*
**Yıldız Technical University, Türkiye*

## ABSTRACT

*In recent years, the concept of sustainability has been gaining importance in every aspect of life. Both environmental disasters and climate change have been raising awareness about the concept of sustainability for every member of any society. As members of a society become more conscious of such issues, companies producing goods and services for the society will have to revisit their practices which have negative consequences on the environment. This is also applicable to the fashion industry which harms the environment the most after the petrochemical industry. In this study, the emergence and development of sustainability in the fashion industry in scientific research have been examined. Considering what kinds of environmental problems that the prevailing 'fast fashion' concept creates in reality, the importance of sustainable fashion was studied. In this regard, the emergence of sustainable fashion and the progress which has been made in academic studies on this topic constitute the main purpose of this study. 96 studies (63 articles, 17 book chapters, 11 conference proceedings and 5 books) are examined. This study encompasses academic studies published till April 2020, when Covid-19 started to affect the whole world negatively. We examined the pre-Covid data in this study because Covid-19 changed the perception of customers to the fashion, fashion industry and fast fashion concept itself. Frequency analyses of articles, conference proceedings, books and book chapters on sustainable fashion were carried out on the basis of a classification made by year, country, type of study, field and research method. In addition, frequencies and content analyses were done by using the keywords in this study. Furthermore, bibliometric and citation analyses were conducted on network diagrams created on the basis of citation details, and leading works and authors in this field. VOS Viewer software were used to do frequency, network and bibliometric analyses, and n-Vivo software used for content analysis.*

**Keywords:** Sustainable fashion, bibliometric analysis, fast fashion issues, slow fashion movement

## INTRODUCTION

Dating back to the 17th century, the concept of fashion has made great progress and transformed itself into a huge industry. This industry has created a strong customer base. Companies in this sector closely follow the market trends and create collections based on the preferences and expectations of customers. Considering the history of their development, these collections vary considerably in terms of quality and quantity. In other words, traditional fashion gives rise to a new one: fast fashion. Fast fashion has acquired a meaning of its own: the production of a collection of low-quality goods at low costs by companies in this sector (The True Cost, 2015). In order to lower production costs, companies reduce the cost of not only raw materials but also labor. As a result, in fast fashion, low-quality raw materials and dyes are commonly used. Also labor cost is kept to a minimum by using third world countries as factories. Although traditional fashion has survived to this day, fast fashion has dominated the sector thanks to such advantages as quick response to the customers and outsourcing labor's intensive operations in other countries (Maxwell, 2014).

On the basis of these features, fast fashion, which drives the intensity of the competitive rivalry, creates an unfair market (Ahluwalia & Miller 2014; Du 2015). Some of the companies in the sector have difficulty selling their products at decent prices, although they manufacture products of high quality thanks to their dressmaking skills. Fast fashion offers a wider range of products available at cheaper prices, and this hinders efforts of companies which make relatively higher quality products. In light of the fact that fast fashion is the rage, such companies are likely to fail in the market (Farrell, 2015).

In addition, fast fashion drives people's desire to consume more. Even during times of economic crises when people are in dire need of money, low price policies urge people to continue being trendy and to consume more. What's more, this craze for consumption poses great dangers to the environment. Not only pre-production and post-production (unsold products or solid wastes) but also supply chain cause indescribable damage to the environment (Taylor, 2014).

Production phase constitutes the most dangerous damage fast fashion gives to the environment. Factories where chemical dyes and low-quality synthetic production materials are used pose serious dangers to nature. Cheap labor is steadily available in countries where such low-quality raw materials are also produced. It is also important to note that in underdeveloped countries where the production of these raw materials is made, there are no strict regulations regarding the environment. As a result, it can be claimed that in this sector, as soon as the production starts, it starts to damage the environment. As a substitute for the existing ones, using new technologies and quality chemicals is more costly. Since fast fashion aims at maximizing profits, it also creates a conflict of interest. In this age, profit takes precedence over human health considerations and the protection of the environment (Battaglia et al., 2014). Although technologies are available to purify water, companies invest in such technologies grudgingly because of their desire to lower costs. It is determined that the amount of water used to produce a single T-shirt is equal to the three-year water consumption of a person. Production in this sector creates 20% of waste contamination on a global scale. Especially in underdeveloped countries where production is made and water is scarce, using water to make textile products leaves very little water for drinking, washing, and cleaning, causing a dearth of water for local people. In addition to water scarcity issues, cases of dermatologic diseases, cancer, organ failure and jaundice are rampant because of textile wastes. Leather industry in Bangladesh produces 75 tons of solid waste and 21600 cubic meter liquid waste on a daily basis. Because of 20 different chemicals they contain, liquid wastes pose the greatest damage to nature (The True Cost, 2015). As a result of this, all living creatures in waters where liquid wastes are dumped are in serious danger. It is estimated that although the dangers of the textile industry are overlooked because of its contributions to local economies, the damage given to the environment and local people in such countries will exceed these contributions in the long run (Chen and Burns, 2006; The True Cost, 2015).

As mentined before, there are basically two types of waste in the fashion industry: production and consumption waste. Production wastes consist of fabric waste/textile waste which can generally be recycled or can sometimes be discarded, while consumption waste refers to clothing items which customers do not buy or wear, or have an expiration date. Dumped in landfills as solid waste, these low-quality raw materials break down, and as a result they not only emit dangerous chemicals into the air but also leak into the soil (Taylor, 2014). Only in the USA, 12,8 million tons of textile products on average are destroyed annually. This figure hovers around 26 million tons in China and 2 million tons in England. In America, in 2013 merely 2,3 million tons of textile products out of 15,13 million tons were recycled (Mangır, 2016, p. 147). Many studies conducted demonstrate that 80% of fabric waste can be effectively recycled. For instance, in Uganda, 81% of all items of clothing are made from fabric wastes imported from other countries.

Fashion industry causes damage not only to nature, natural resources, and people living in any country but also to those who are part of the supply chain in the textile industry. Substandard working conditions, low wages, failure to follow the regulations to provide occupational health and safety of workers all pose serious risks to workers. In this labor-intensive sector, it is a common practice to employ non-covered employees, even child workers. Although fast fashion companies enjoy high annual earnings, their mistreatment of workers frequently make the headlines around the world. In Bangladesh, which is the location for the production of many textile companies, women constitute a substantial number of workers. In addition to the bad working conditions, wages given to workers are so low that workers hardly make ends meet on this pittance. A global textile corporation can relocate its production facilities to another country where it has access to cheap raw materials and labor in order to reduce the production costs. Alternatively, this corporation can make an outsourcing contract with one of the local companies. Since global companies are in a strong bargaining position, as they have access to a big number of local companies trying to win a contract with such global companies, local companies tend to lower labor costs in order to secure a contract with such global companies. Suppliers cannot cut back on labor costs anymore, so they try to reduce the cost of repair and maintenance of factories and machinery in order to cut costs. This method of cutting costs might pose grave risks, even death in terms of occupational health and safety. A 2013 disaster can be cited as a case in point for this practice. Rana Plaza collapsed and claimed the lives of 1129 workers since the necessary maintenance was not done properly because of lack of budget despite workers' frequent

complaints. It is possible to claim that in countries where similar incidents happen, the states have no power to impose sanctions and take no initiative to improve standards (Westervelt 2015; The True Cost, 2015).

One of the biggest and long-standing industries, the fashion industry still continues its existence, although it is the second most dangerous industry to the environment after the petroleum industry. This industry has a comparable impact on the environment in line with its tremendous size (Goworek et al 2013). In a study conducted by Joy and et al. on people aged between 20 and 35 living in Canada, individuals do not look at the fashion concept from the perspective of sustainability and fail to consider the compatibility of the two concepts: sustainability and fashion. However, all the environmental disasters and the effects of climate change give a warning about how our world has been turned into a more uninhabitable place in each passing day. Regarding this, in this study, the emergence and development of sustainable fashion in the literature were investigated.

# THEORETICAL FRAMEWORK

## Sustainability

Gilman defines sustainability as “maintaining the functionality of a society, ecosystem or an existing system without depleting main resources" (Gilman, 1992). Sustainability is also defined as an environmental worldview which aims to achieve economic growth by wisely utilizing natural resources, paying attention to environmental concerns, avoiding wasting resources and considering the rights and benefits of the succeeding generations (Keleş, 1998- Dictionary of Urbanalogy Terms). According to the definition of Brundtland Commission in Our Common Future (The Report of the World Commission on Environment and Development), sustainability and sustainable development mean fulfilling the needs of current generation without compromising the rights of the future generations to meet their own needs (Eser, Çelik, Çay , & Akgümüş, 2016, s. 45). Sustainability aims at providing growth by having people change merely their consumption habits without lowering their current standards of living. A sustainable development aims at trying to transform a consumerist society into a new one which is conscious of environmental concerns and social responsibilities, in addition to economic issues.

Hardi & Zdan (1997) classified dimensions of sustainable growth into three categories: economic, social and environmental sustainability. Later, Azapagic & Perdan (2000) claimed that these three aspects are not distinct from each other, but have overlapping areas. In World Social Growth Summit held in 2005, it was determined that these three aspects are not independent rather interconnected. In other words, they are considered unified aspects, which cannot exist in the absence of any one of them (Yılmaz & Bakış, 2015, p. 2254). Regarding the dimensions of sustainability, Liu (2009) claimed that there are three dimensions, yet they should be defined as dimensions overlapping with each other. Economic sustainability is a subcategory of social sustainability; social sustainability, along with economic sustainability, is a subcategory of environmental sustainability (Liu, 2009). Although in the literature sustainability is defined in terms of its economic, environmental and social aspects, there are also researchers who explore sustainability in four dimensions (economics, ecology, culture, and politics) or seven dimensions (economy, social, occupational groups, environment, physiology, government and culture) (James and Magee, 2018). As a result, a three-dimensional model (economic, social and environmental) gained wider acceptance among researchers.

The most common and highlighted aspect of sustainability by profit-oriented companies is economic sustainability. In general, economic sustainability tries to make efficient use of sources and manage them properly so as to provide a steady investment by public and private sectors (Azapagic & Perdan, 2000). When it comes to what it means for companies, economic sustainability means achieving a balance between revenue and expenditure, sustaining the viability of the company, and maximizing production with the lowest possible costs, constituting the main goal of any company. In addition, measures such as using renewable sources and keeping the energy and raw materials used to a minimum help maintain sustainability (Özçuhadar, 2007, s. 14). The underlying assumption about current economic development models is that as individuals have more purchasing power, economic mobility increases. This, in turn, increases gross national product, benefiting the individuals as well. This model rests on unlimited production and consumption. Considering the ecology, the model also requires the exploitation of the natural resources as if they are unlimited. However, it is a fact that natural resources used to satisfy people’s fundamental needs are limited, and they are not replenished as a result of excessive use, diminishing in amount in each passing day. In order to achieve a balance between production and consumption in

economic activities, awareness about ecology and social justice should be taken into account (Yılmaz & Bakış, 2015, s. 2255). Another aspect of sustainability, social aspect, focuses on rights and liberties of individuals (Universal Declaration of Human Rights, 1948). One of these fundamental rights and liberties is to provide intergenerational equity. The current resources must be passed on to the future generations so that they could maintain their life in a sustainable fashion. Every individual is entitled to have the right to improve his or her conditions regarding shelter, education, health services etc. Companies should do their parts to provide such equity for their workers and the societies in which they operate. Environmental sustainability, which is one of the most recently understood aspects of sustainability and contains other aspects (Liu, 2009), means passing on the world to the next generation in a better condition and protecting the ecological balance and natural systems from dangers (Sev, 2009). This fundamental principle necessitates using resources sustainably by taking into consideration the earth's finite resources.

The sustainability of any source relies on the ability of that source to replenish itself. For example, one of the requirements for the water cycle on earth is the cleanliness of water and air. Any incidents which might hamper this cycle through such activities as using pesticides intensively or leaking chemical wastes into soil can put the availability/sustainability of water for future generations in jeopardy. As a result, any source should be used cautiously without hurting any other source and the ability of any source to replenish itself should be taken into consideration (Patel & Chugan, 2013). While manufacturing anything, companies should use natural sources carefully and get rid of waste after the production properly without harming the environment.

# Fashion Industry and Sustainability

## Fast Fashion and Sustainability

The concept of fashion derives from a French word "fasaun", from old French "façon", which means good style or manners in the 17th century (Waquet & Laporte, 2011, s. 7). Fashion means the acceptance of a common style by the majority of people. The concept of style is necessary to differentiate oneself in a group (Diamond & Diamond, 2006). Generally associated with the clothing industry, the concept of fashion led to the interchangeable use of these two concepts: fashion and style (King & Ring , 1980, s. 13).

Fashion entails change and novelty. Fashion industry is always in a state of change with the introduction of the concept season. The main purpose of the system is to have customers in their minds' desire to have new models by adding value to them (Arnold, 2009). With this in mind, in traditional fashion, fashion companies usually produce collections in any given year for Spring/Summer and Autumn/Winter and present them to customers biannually (Pookulangara & Shephard 2013). In this process, adhering to the quality principle, tailors produce clothing items at high costs using talented designers and pattern makers, and while making clothing items, expensive raw materials are used (Claxton & Kent, 2020).

Fast fashion is significantly different from traditional fashion. Fast fashion refers to collection products which are replications of high-quality designs of brands at a low cost using low-quality raw materials. This helps individuals with low-income levels satisfy their wants by accessing products with good design (Rausch & Kopplin 2021). The purpose of manufacturers is to broaden the customer base in order to maximize their profits. The key to achieving this is to lower costs and offer affordable prices (The True Cost, 2015). Costs can be cut by reducing the costs of raw materials and labor. As a result, in the fast fashion industry, low-quality raw materials and dyes etc. are widely used, and labor costs are reduced by outsourcing the production department of the companies to underdeveloped countries. Although traditional fashion still continues its existence, fast fashion has dominated the market thanks to its advantages such as speed and the outsourcing strategy (Maxwell, 2014). The new business model created by fast fashion was adopted by companies in the fashion industry in order to maintain economic sustainability.

Low-cost raw materials used in fast fashion (fiber, dyes, bleachers etc.) cause products to degrade, tear, and wear out in a short time. In order to avert customer dissatisfaction, the fashion cycle has been accelerated. Since products become out of trend without completing their economic lifespan or being worn-out, they either are shelved or get thrown away. Consumerism helps companies manage the perceptions of customers and they, in turn, start to see this abnormality as something normal. In fast fashion, unlike traditional fashion, collections are not seasonal. Companies dispatch new collections to stores on a weekly or even daily basis. High-fashion conscious consumers tend to buy trendy products with low costs, although

they are aware of the quality and durability of the products. The fast pace of changing trends force customers to buy more garments, making them ignore criteria for quality and luxury (Whitehead, 2014).

Consumerism triggered by fast fashion helps manage the perceptions of customers. However, harmful to both the nature and health of human beings, low-quality (chemical) materials as production waste damage the environment. In addition, once customers use them, these products with short economic lifespan are discarded, further devastating the ecosystem. Even though companies maintain their economic viability thanks to this cycle and fast pace, consumers and the environment are adversely affected as a result (Maxwell, 2014). Since these products discarded as solid waste are made from low-quality raw materials, during their breakdown, dangerous chemicals are released into the air and leak into the soil (Taylor, 2014). In this respect, fast fashion causes serious problems in terms of environmental sustainability.

Fast fashion poses a serious risk to economic sustainability in addition to environmental sustainability. Companies which cannot keep pace with the speed and costs of fast fashion will lag behind their rivals in the market, ultimately going out of business. This sooner or later helps companies which use low-quality raw materials, give their workers low wages and provide bad working conditions or no employee benefits gain competitive advantage (Ahluwalia & Miller 2014; Du 2015). Thanks to the availability of low labor wages in least developed countries, companies exploit the labor force, forcing them to work in terrible working conditions (The True Cost, 2015). Taking this into account, it can be claimed that the fashion industry creates problems in terms of social sustainability as well. In time, those companies which produce high-quality products and protect the rights of their workers will go out of business in the face of keen competition (Farrell, 2015). It is necessary to note that ethical issues should be examined separately. When evaluated from three fundamental sustainability aspects, fast fashion has been growing substantially despite all the problems associated with it. Many fast fashion companies (Zara, H&M etc.) report record level annual earnings from sales (Roll, 2019).

## Slow Fashion Movement and The Concept of Sustainable Fashion

The concept of slow fashion was first coined in 2008 by Kate Fletcher (Kowalski, 2018). According to Fletcher (2008), slow fashion means maintaining a quality lifestyle with the help of better design and production and consumption systems. It focuses not on time restrictions but on quality. Yet, it does not necessarily have to be slow, as the name literally implies. It gives manufacturers enough time to produce high-quality products and pay attention to the environment and labor rights (Fletcher, 2012). It tries to offer creative solutions to the problems fast fashion has created. It aims at helping customers create an individual style, yet they try to achieve this goal through quality and long-lasting garments (Fletcher, 2010).

It is because of these values that consumers will relieve the psychological and monetary stress caused by fast consumerism and will instead focus on creating their own style.

In this regard, the goals of slow fashion can be listed as follows (Kowalski, 2018):

- Producing items focusing on long-term factors based on design
- Localizing designs and production considering the cultural diversity
- Offering customers repair, barter, and recycling services after the production when needed instead of abandoning them
- Reducing wastes to minimum levels and avoiding harming the environment. While acting on this principle, producing quality products without ignoring aesthetic concerns
- Utilizing labor, energy, and sources as much as is necessary
- Using dyes and chemicals which do not hurt the environment during the production

It is expected that slow fashion which is trying to carve out a niche in the market will develop in several ways. Supporting workers, continuously coming up with innovative production techniques, focusing on processes to devise new techniques, localizing production and supply chains, properly dealing with customer complaints and inquiries, and creating a customized fashion sense can be listed among these ways (Kowalski, 2018).

The purpose of slow fashion is to change a customer's perception of low cost/high yield and instead to have them adopt a fair cost/quality product concept. With its positive aspects, slow fashion provides customers with long-lasting designs by protecting workers in the consumption cycle and nature as well. Conceptually, slow fashion and sustainability have close semantic relations (Jung & Jin, 2014). Sustainable fashion is

also referred to as green fashion (Strähle, 2017), ethical fashion (Shen et al., 2012), recyclable fashion (Carey & Cervellon 2014) and ecological fashion (Ceylan, 2019) in the literature. In addition to these, recyclable fashion is used to refer to fashion produced out of recyclable products (Carey & Cervellon 2014).

Sustainable fashion arose as a reaction to the use of garments which damage the ecological life, unnecessary shopping, bad working conditions of workers producing clothes, and excessive water and energy consumption (Akbulut, 2012). Similarly, Johnson (2012) states that *"sustainable fashion seeks to empower workers throughout the supply chain, utilize upcycling, recycling, and traditional production techniques, and incorporate renewable and organic raw materials."* (Johnston 2012). In other words, sustainable fashion adopts an approach which utilizes sustainable products at every stage of the production, deals with wastes sustainably, and aims at maintaining this approach continuously. Nowadays, many famous brands (Nike, H&M, GAP), in order to reduce their impact on the environment, release their sustainable fashion collections and improve themselves in this regard (Shen, 2014).

Sharing a similar scope with slow fashion, sustainable fashion suggests a practice in order to provide sustainable production and consumption: it tries to have customers establish a personal relationship with their clothes (Henninger et al., 2016). In order to form this relationship, sustainable fashion recommends involving customers in the production processes. A novel way to achieve this goal might be to present customers with semi-finished products instead of providing them with finished products. This makes it possible for customers to make changes to the products on the basis of their preferences. This will, in turn, help customers to build a relationship with the product and therefore use it longer. Alternatively, adopting slow fashion can make it possible to manufacture products with durable, quality, and sustainable materials (Niinimaki & Hassi, 2011). The idea of manufacturing on-demand based on the wishes of the customers can be a good implementation of sustainable fashion. A fundamental principle of slow fashion, after production service, focusing on repairing degraded or torn parts of the products or renting them extends products' life cycles. However, this business model is difficult to put into practice for fast fashion companies making mass or batch production. This business model is suitable for companies which manufacture products on demand. Since this requires huge investments and reengineering work, existing fast fashion companies will not be willing to meet huge capital costs. Nevertheless, as factors such as legal requirements, public trust, demands of customers or investors force companies to adopt sustainable practices, companies will have no choice but to follow suit (Voorhees, 1998).

# METHOD

This study aims at evaluating how sustainable fashion is dealt with from the past to the present, in which countries it was studied along with which concepts, and which authors and publications play a leading role in the field. In other words, it tries to provide an in-depth understanding of the concept of sustainable fashion.

## Sample

This study encompasses academic studies published till April 2020, when Covid-19 started to affect the whole world negatively. We examined the pre-Covid data in this study because Covid-19 changed the perception of customers to the fashion, fashion industry and fast fashion concept itself. After reviewing the academic database, it was observed that between 2008 and 2021 such studies were located in the literature. Articles, books, book chapters and conference proceedings on sustainable fashion constitute the sample of this study. The concept of "sustainable fashion" was searched in keywords, titles and abstracts of papers published and indexed in Scopus database till April 2020. So we reached 101 studies. After eliminating repeated studies, 96 studies were left (each of the study can be seen as a list, after the references part). This sample consists of 63 articles, 17 book chapters, 11 conference proceedings and 5 books (see Figure 1).

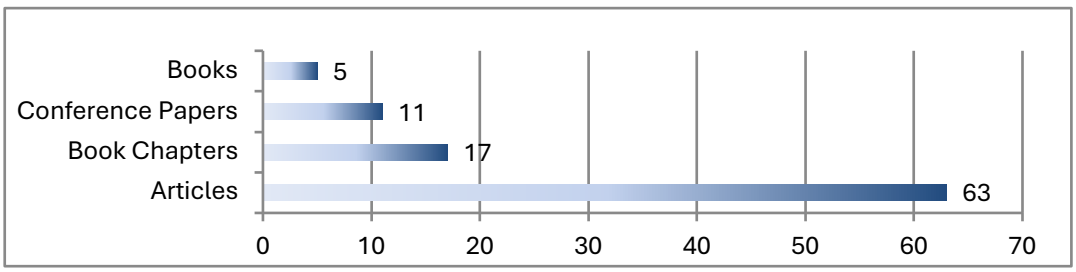


**Figure 1.** The distribution of studies on sustainable fashion by type

A total of 96 articles, books, book chapters, and conference proceedings published all around the world on sustainable fashion were analyzed, and the evolution of the concept of sustainable fashion was investigated from the past to the present. It is natural to see first instances of newly emerging concepts in conference proceedings in the literature. When it comes to subjects which are examined for a long period of time, they become the research focus of books. Although sustainable fashion is a relatively new subject being investigated in the literature, the fact that it is researched through articles instead of conference proceedings can be attributed to the nature of the database. There are many indexed peer-reviewed journals in the Scopus database, though the number of indexed conference proceedings is relatively limited. Given that the sampling of this study is based on data from this database, this can be easily accounted for.

# Design

First, documents taken from Scopus database were analyzed on the basis of the following headings:

- Type of the publication
- Publication date
- Country where the university authors work for is located
- Field
- Type of data
- Research method
- Keyword analysis (frequency, content and bibliometric)
- Authors of the publications
- Citations to the publications

After examining papers on the basis of the above headings with frequency analysis, an in-depth analysis of these papers was performed using content analysis (keywords), bibliometric analysis/network analysis (keywords, authors, and citations). Excel and VOS Viewer programs were used to carry out frequency, network and bibliometric analyses; for content analysis, n-Vivo software was utilized. As a result of this study, the distribution of articles written on sustainable fashion by year, country and type, the frequency of concepts and their pairings, the authors and their co-authors and leading studies were determined.

# Results

## Frequency distributions

This section gives information about articles, conference proceedings, books and book chapters on sustainable fashion by year, country, type of the study, field and method of research along with the frequency of these categories.

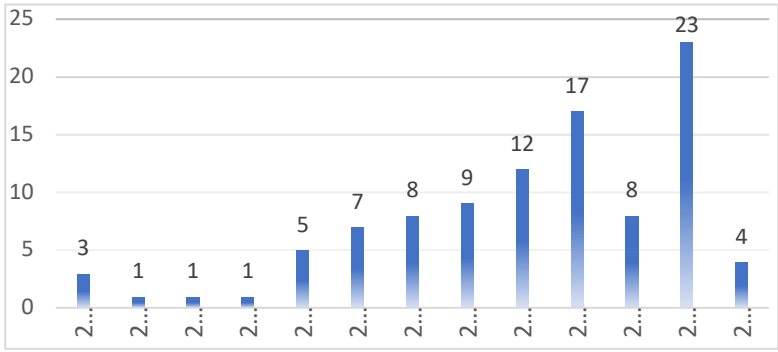


**Figure 2.** The distribution of studies on sustainable fashion by year

It was observed that academic studies on sustainable fashion started to be located in the literature in 2008 and thereafter the number of articles, books and conference proceedings continued an upward trend (Figure 2). Especially between 2012 and 2014 that number increased significantly, reaching a peak number of 23 articles in 2019. Since literature review comprised of the papers which was published before April, 2020, all the studies done in that year were not included in this study, as is expected. As the concept of sustainable fashion has gained in popularity, more studies have been carried out on it.

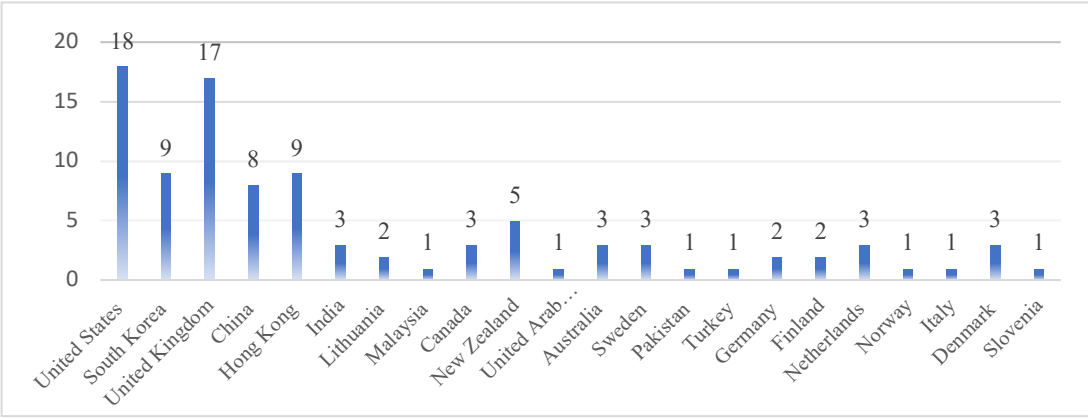


**Figure 3.** The distribution of studies on sustainable fashion by country

After reviewing the literature for studies on sustainable fashion, it was observed that the majority of the academic studies were published by researchers in the USA and Great Britain. After these two countries come South Korea with 9 studies, Hong Kong 9 studies and China 8 studies, where a considerable number of studies were made, as seen in Figure 3. Especially, regarding consumption, the USA is a leading country. In line with this, Americans can also be cited as a good example of consumption frenzy for products in the fashion industry, and so naturally scientists focus their attention on this subject. Scientists who think that large populations in the Far East consume an abundance of resources started to carry out research on sustainability and sustainable fashion. In other geographical areas, some academic studies are carried out, although their numbers are limited.

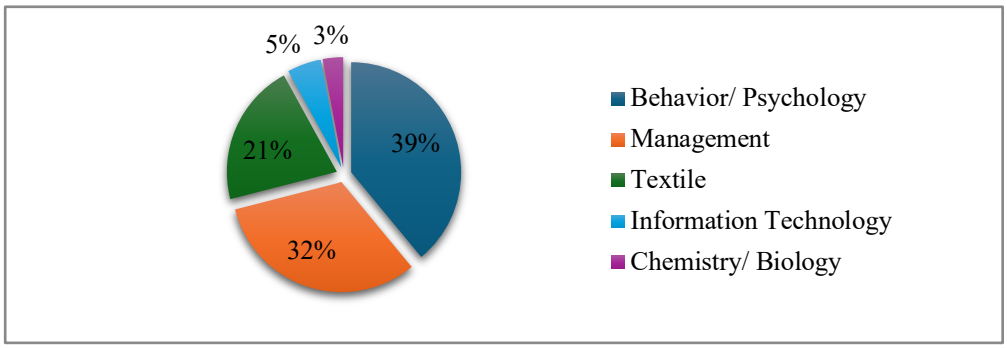


**Figure 4.** The distribution of studies on sustainable fashion by scientific fields

It was observed on Figure 4 that 39% of academic studies on sustainable fashion (36 studies) consist of studies in the behavior/psychology field. The focus of these studies is to examine how customers avoid fast fashion and adopt sustainable fashion practices. 32% of such studies contain subjects related to management in general. In this category, there are academic studies which focus not only on how sustainable fashion as a business model can be implemented in the textile sector but also on how companies can devise new production, distribution, marketing etc. strategies. The sampling of this study includes 19 articles on textile related subjects, constituting 21% of all the studies. It should be noted that fashion is a corollary of the textile industry. Thus, how the textile industry restructures its business processes to promote sustainable fashion products constitutes the main focus of the studies in this category. Apart from these three main categories, the rest of the studies consist of studies on information technologies at 5% and those related to chemistry at 3%.

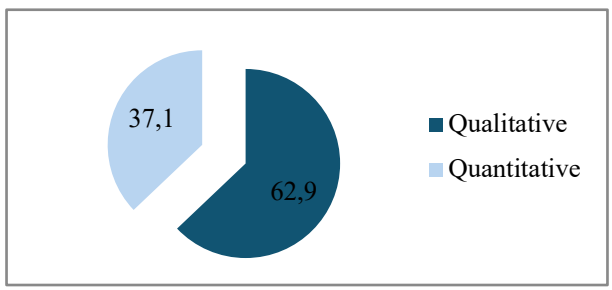


**Figure 5.** The distribution of studies on sustainable fashion by research type on the basis of data collection technique

In the sampling of this study, it is established that data used in academic studies on sustainable fashion vary, as seen in Figure 5. 63% of the 96 academic articles included in the study consist of qualitative data, and 37% quantitative data, and analysis was made on the basis of this data set.

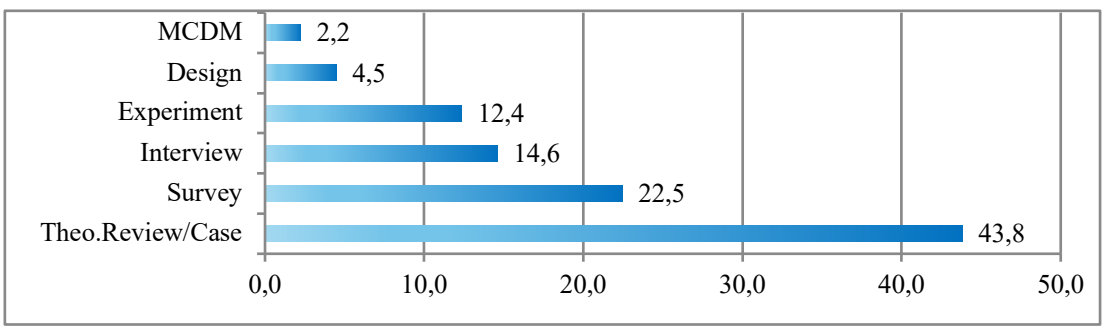


**Figure 6.** The distribution of studies on sustainable fashion by scientific methods

Within the scope of this study, the methodologies of research papers on sustainable fashion vary from each other. As is seen in the diagram in Figure 6, approximately half of the articles on sustainable fashion focus on conceptual studies, which can be classified into two categories. In the first group are found studies which define the concept, explain how it emerged in the textile sector, and provide theoretical explanations for the necessity of this concept. In the second group, there are studies which examine the sustainable fashion concept along with its good and bad cases and mention its necessity on the basis of certain cases. Both groups of studies are qualitative studies which deal with sustainable fashion either from a theoretical perspective or on the basis of case studies and constitute almost 44% of all studies done in this field. Another type of study done using qualitative data is interviews. Answers to open-ended questions given by individuals are recorded, and based on them, some conclusions are tried to be reached (Neuman, 2007). As is seen in the diagram, the interview method is used in approximately 15% of studies on sustainable fashion. Mathematical modeling and design research can be regarded as qualitative research and there are such studies done on sustainable fashion. The rate of studies which examine sustainable fashion in terms of obstacles and advantages or model the concept through simulation on the basis of company function and processes is 4.5%.

Other studies on sustainable fashion are carried out using quantitative data. As shown in the diagram in Figure 6, in 22.5% of such studies survey methods are used. In these studies, the perception of individuals regarding sustainable fashion in certain sections of the society is measured using rated scales. There is no reference to a unified perception of sustainable fashion among those individuals. Instead, customers' ideas are measured in different contexts. It is seen that there is a need for a psychometric scale of perception of sustainable fashion.

Another quantitative method used in studies on sustainable fashion is experiments which comprise 12% of these studies. Experimental studies are frequently encountered in published studies in textile and chemistry, yet they are rarely used in studies on customer behavior. In 2.2.% of studies on sustainable fashion, multi-criteria decision-making methods are used. This quantitative research method which investigates possible selections on the basis of different criteria is more commonly employed concerning the choices of customers.

## Bibliometric Analyses

In this section, the frequency and network analyses of keywords in articles, books, book chapters, and conference proceedings on sustainable fashion are given. Diagrams created using VOS Viewer software give information about both the frequency of concepts and with which concepts they are used together. Based on this, findings are interpreted. Utilizing the same program, network diagrams are created on the basis of author and citation indexes and given in the following sections along with their interpretations.

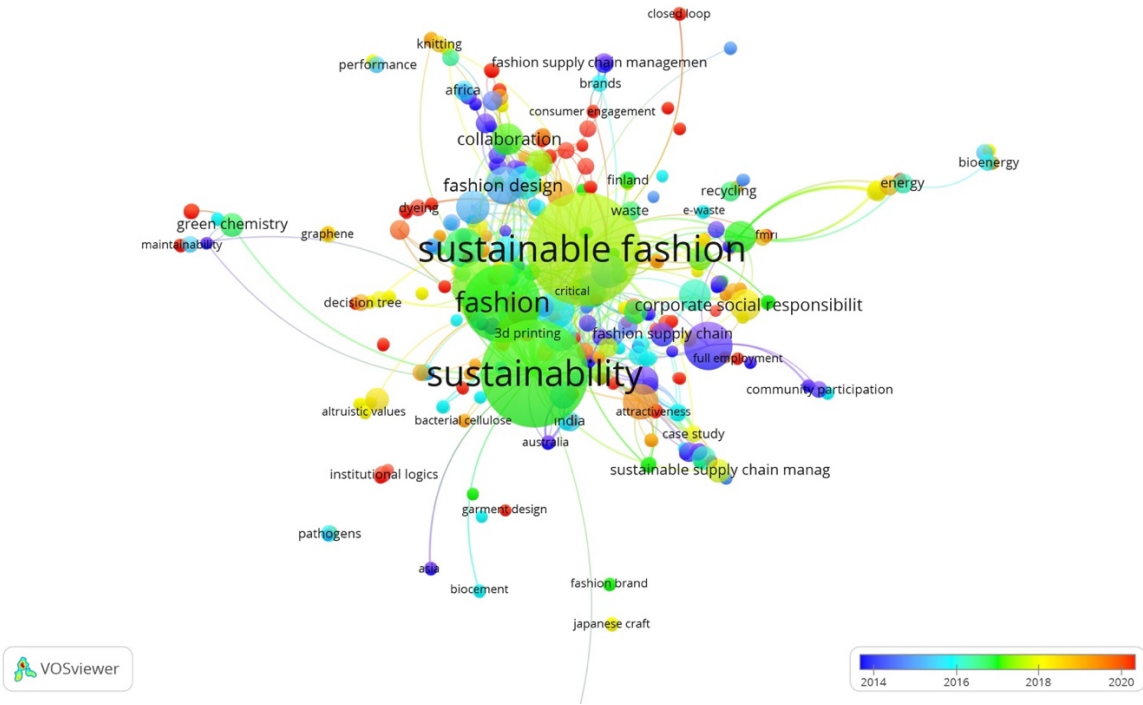


**Figure 7.** The frequency and network analysis of keywords in studies on sustainable fashion

The network analysis of keywords in studies on sustainable fashion is given in Figure 7. This figure shows both the frequency and pairings of the concepts.

As is shown in Figure 2 previously, the concept of sustainable fashion was used for the first time in academic literature in 2008. As of 2012, the number of academic studies on sustainable fashion has increased dramatically.

In studies undertaken in 2008, sustainable fashion was studied together with concepts related to product/company sustainability. These studies focus more on sustainability efforts within the scope of economic sustainability such as which textile products are durable/sustainable and how companies can enhance their productivity through supply chain management. However, in studies carried out in 2008, the concept of "sustainable development" was mentioned in the related studies.

From 2008 until 2012, only a limited number of academic studies on sustainable fashion were conducted (see Figure 2). However, as of 2012, this number increased and in addition to the concept of "sustainable development" used in previous studies, new concepts such as "eco-fashion consumption decision" and "sustainable consumption" were started to be used. When concepts studied along with sustainable fashion were investigated, concepts of economic sustainability (supply chain management, product/ store related attributes etc.) have come to the forefront.

Unlike concepts mentioned in previous years, in 2013 concepts such as "sustainable clothing", "textile recycling", and "sustainable design" were started to be used, while in 2014, new concepts such as "upcycling" and "zero waste" were added to the list of concepts. When the concepts studied along with sustainable fashion were examined in 2013 and 2014, many instances of economic sustainability (fashion operations, performance, reconstruction, supply chain management etc.) were found, as was the case in previous years.

In 2015, advanced issues of the concept of sustainability were observed in keywords. In studies done in that year, first instances of concepts such as "accountability", "environmentalism", "ethics", "redesign",

"second hand consumption", and "sustainable fashion pioneers" were located. Furthermore, it was in 2015 that for the first time sustainable fashion was studied together with educational concepts (flexible learning, virtual learning, distance learning/education) regarded as concepts of social sustainability. As was the case in previous years, in studies done in 2015 sustainable fashion was also studied together with concepts of economic sustainability (business, models, organizational change, partnership etc.). When it comes to keywords, it was observed that the number of concepts of economic sustainability is close to that of the concepts of social and environmental sustainability.

Starting to be dealt with in 2015, advanced issues of the concept of sustainability have also been studied in later years. In 2016, concepts such as "corporate social responsibility", "longevity", "natural fibers", "natural materialism", "sustainable fashion criteria", "sustainable knowledge sources", and "sustainable fashion supply chain" were used. Similarly, in 2017, concepts such as "government regulations" and "green value" were started to be used. During these years, it is clearly observed that academic studies on sustainable fashion have increased in number and diversified in terms of quantity and quality. In addition, it is essential to note that the concept of "supply chain management" which was used in all the studies in previous years gave way to the concept of "sustainable supply chain management" as of 2016. For during these years, it was also observed that other concepts with the exception of "supply" chain management" which was considered within the frame of economic sustainability differentiated. Concepts such as "micro-organizational structure" and "new business models" show efforts companies put into aligning their processes/structures in order to promote sustainable fashion.

It was observed that in studies carried out on sustainable fashion in 2018 keywords such as "democratic fashion", "green marketing", "social design", "sustainable branding", and "sustainable operations" were mentioned. In 2019, in addition to these keywords, "activism", "climate justice", "customer equity", "ethical fashion", "ethical behavior", "social welfare", "sustainability challengers", "sustainopreneurship" were found in the literature. These keywords have shown the importance of sustainability in terms of both social and environmental aspects in each passing year. While the economic aspect of sustainability was studied more in early articles published in 2008, in about ten years later the scope of studies on economic sustainability (sustainable fashion business operations, structure regeneration, sustainable supply chain centralization, green marketing, fashion industry etc.) has widened greatly. The elements of economic sustainability have come to include environmental and social aspects and so a holistic approach to the concept has been adopted.

Through the keyword analysis, the year of first usage of sustainability related concepts and their pair concepts in studies on sustainable fashion were interpreted. In addition to this, there are also concepts which are used only one time in published studies in different years. These concepts and their frequencies by year are given in Table 1.

**Table 1:** Frequencies of Sustainability Related Concepts by Year

| | 2008 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|
| Sustainability | 1 | | 3 | 1 | 2 | 4 | 1 | 6 | 6 |
| Sustainable fashion | 1 | | | 2 | 2 | 7 | 3 | 3 | 10 |
| Eco-fashion | | 2 | 2 | | 1 | | 1 | 1 | 1 |
| Sustainable development | 1 | 1 | | | | | 1 | | |
| Sustainable consumption | | 1 | 1 | | 1 | 1 | 4 | | |
| Consumer behavior/ perception | | 1 | 1 | 1 | | 1 | 6 | 1 | 3 |
| Technology related words | | | 1 | | 3 | 2 | 1 | 1 | 2 |
| Total | 3 | 5 | 8 | 4 | 9 | 15 | 17 | 12 | 22 |

As displayed in Table 1, the frequency of the concept of sustainability in the keywords of the articles examined within the scope of this study has increased over the years. This holds true for the main subject of this study: sustainable fashion. This increase can be attributed to the ever-increasing importance of the related concepts and to the fact that they are studied more academically. The concept eco-fashion includes only the ecological/environmental aspect of the concept sustainable fashion. An increasing-number of

studies on this concept has also been found in the literature. Sustainable development was mentioned in the first United Nations Sustainability Conference and is a concept with a wider scope. In this regard, this concept has also been found in articles on sustainable fashion over the years.

The main focus of marketing, the wants, expectations, attitudes, and behavior of consumers, can be traced with the following keywords in studies on sustainable fashion: “sustainable consumption”, “consumer perception/ behavior”, “consumer decision making”, and “consumer ethical behavior”. As is shown in Table 1, among studies on sustainable fashion, the number of studies focusing on the perception, attitude, and behavior of consumers has increased over the years.

In addition, within the scope of this paper, it was also observed that studies on sustainable fashion include technology-related concepts. In 2013, one study on laser technology was published, in 2015 three articles on various technologies were written, and in 2016 2 studies on information systems used in the fashion industry were carried out. As for the years 2017, 2018, and 2019, keywords in new technologies used in all sectors such as “artificial intelligence”, “3D printing”, “face-saving”, and “mobile application” were encountered. This shows that in the fashion industry new technological advances were followed and they became the topic of research papers. It is also possible that companies started to make better use of technology so as to promote sustainable fashion.

After running a keyword analysis, a frequency and network analyses of authors were made using VOS viewer software. The color intensity spectrum in the Figure 8 from yellow to red represents the years in which authors published their studies on sustainable fashion. The number of such studies increased, as shown by the increasing color intensity in the Figure. In present research, 96 studies were done by 235 researchers that published their studies sometimes as single-author, sometimes as multiple-authors. The connections between the authors given in the Figure 8 show which authors worked together.

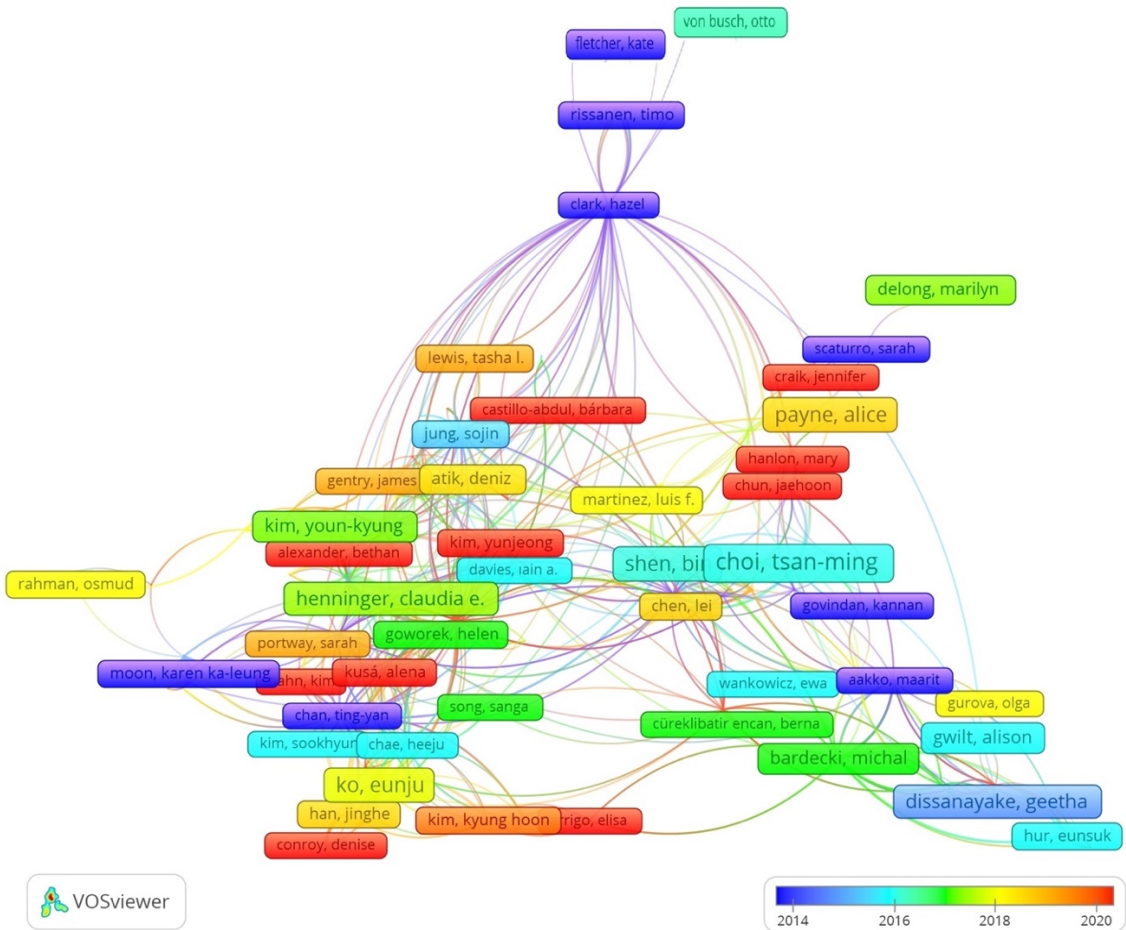


Figure 8. The frequency and network analysis of authors doing research on sustainable fashion

As shown in Figure 8, Tsan-Ming Choi who is the most published author on sustainable fashion, has 10 different research papers. (Fung et al., 2020; Choi et al., 2019; Choi & Luo, 2019; Cai et al., 2019; Choi & Shen, 2016; Choi & Li, 2015; Choi et al., 2014; Choi & Cheng, 2015; Pui-Yan Ho & Choi, 2012; Choi & Chiu, 2012). Then came Eunju Ko [1*] with 6 different studies (Fifita et al., 2020; Lee et al., 2020; Kong & Ko, 2017; Song & Ko, 2017; Han et al., 2017; Kong et al., 2016), Bin Shen[2**] with different 6 studies (Choi et al., 2019; Wang & Shen, 2017; Shen et al., 2017; Choi & Shen, 2016; Shen, 2014; Shen et al., 2014) and Alice Payne with 6 different studies (Gopura & Payne, 2019; Payne, 2019; Gwilt et al., 2019; Payne & Ferrero-Regis, 2019; Payne, 2018; Binotto & Payne, 2017). After that Claudia E.Henninger published 6 different studies (Blazquez et al., 2020; Mukendi & Henninger, 2020; Han et al., 2017; Henninger et al., 2016; Henninger &Singh 2017; Lai et al., 2017). The next batch of 7 researchers have 4, 13 researchers have 3, 79 researchers have 2 different studies on sustainable fashion. The rest of the researchers published only one study.

After examining the papers by these authors, citations to these studies on sustainable fashion papers were also investigated (See Figure 9).


**Figure 9.** The frequency and network analysis of authors whose studies on sustainable fashion are cited in the literature

As is seen in Figure 9, Markus Antonietti is the most cited author (1650 citations[3***]) with 2 studies (Markushyna et al., 2019; Hu et al., 2010). 1595 citation of the Antonietti come from his collaborative work (Hu et al., 2010). The collaborative work of authors Bo Hu, Kan Wang, Liheng Wu, Shu-Hong Yu, Markus Antonietti, Maria-Magdalena Titirici is the second most cited publication, 1595 citations*** (Hu et al.,

[1*] Choi T.-M. and Ko E. work together in the same joint study group.

[2**] Choi T.-M. and Shen. work together in the same joint study group.

[3] *** Citation recorded on March 7, 2025.

2010). Ackermann Lutz got 865 citations*** from 3 studies (Gandeepan et al., 2020; Gońka et al., 2019; De Sarkar et al., 2014). These three most cited researches were conducted in chemistry field. While the author Choi did the most studies on sustainable fashion with 10 studies (Fung et al., 2020; Choi et al., 2019; Choi & Luo, 2019; Cai et al., 2019; Choi & Shen, 2016; Choi & Li, 2015; Choi et al., 2014; Choi & Cheng, 2015; Pui-Yan Ho & Choi, 2012; Choi & Chiu, 2012) accumulating 784 citations*** (recorded on March 7, 2025), Hu et al., (2010) did only one study which was cited more than these 10 studies. Choi's researches were conducted in the field of supply chain management of industrial engineering and logistics.

As is shown clearly in Figure 9, the collaborative work of authors Suman De Sarkar, Weiping Liu, Sergei I. Kozhushkov and Lutz Ackermann (2014) was cited 685 times by the other researchers. This research was conducted in chemistry field. Subsequently, Bin Shen has 525 citations of her 6 studies (Choi et al., 2019; Wang & Shen, 2017; Shen et al., 2017; Choi & Shen, 2016; Shen, 2014; Shen et al., 2014) from the industrial engineering and logistics fields. Then Lisa McNeil has 497 citations from her 2 studies (McNeill & Venter, 2019; Mcneill & Moore, 2015), Eunju Ko has 456 citations from his 6 studies (Fifita et al., 2020; Lee et al., 2020; Kong & Ko, 2017; Song & Ko, 2017; Han et al., 2017; Kong et al., 2016) and Claudia E. Henninger 423 citation from her 6 studies (Blazquez et al., 2020; Mukendi & Henninger, 2020; Han et al., 2017; Henninger et al., 2016; Henninger &Singh 2017; Lai et al., 2017). Those three authors' researches are published in the marketing journals in this field.

Research of Bo Hu, Kan Wang, Liheng Wu, Shu-Hong Yu, Markus Antonietti, Maria-Magdalena Titirici, (2010) are represented with the color blue and this shows that these authors wrote their papers in 2012 or in previous years. As a result, it can be claimed that the study could form the basis of studies on sustainable fashion or set the course of future academic studies for chemistry field. Choi's studies could be evaluated as pioneering studies about sustainable fashion for the industrial engineering and logistics fields. McNeil, Ko and Henninger's studies might be accepted as the basic researches for the marketing research within the sustainable fashion framework. Whereas Tsan-Ming Choi was expected to be cited more since he published more papers, the work of authors Bo Hu, Kan Wang, Liheng Wu, Shu-Hong Yu, Markus Antonietti, Maria-Magdalena Titirici, (2010), who wrote fewer articles had more citations. This can be attributed to the fact that their papers contained fundamental information on sustainable fashion or were of higher quality content. Another reason is that previous studies had comparatively more time to be cited in the literature.

When checking the sources which published papers about sustainable fashion, it was observed that journal of "Sustainability" is leading journal published the documents about sustainable fashion (23 papers). In addition, other research papers cited 1154 times to mentioned 23 papers.

When checking the sources which published papers about sustainable fashion, it is observed that "Sustainability" is leading journal published the documents about sustainable fashion (23 papers). In addition, other papers cite 1154 times citation to mentioned 23 papers. However, only one paper published in the journal of Advanced Materials by Hu et al. (2010) was cited 1595 times by other research papers.

# CONCLUSION

In recent years, the concept of sustainable fashion has gained considerable importance. Not only natural disasters but also climate change have raised an awareness about sustainability in every segment of society. This prompts individuals to change their desires, attitudes, and behavior (Goworek et al 2013). The ability of companies to stay in business in the sector depends on their capability to deal with the desires and expectations of consumers who are becoming increasingly conscious of the impact of the industry. Especially in the fashion industry, sustainable development can only be achieved if companies revolutionize their practices.

In this study inspired by the growth in the fashion industry, we aim at researching how the concept of sustainable fashion became the subject of academic studies and how it developed. To that end, we reviewed the keyword, title, and abstract sections of academic studies published till April, 2020 and we obtained a total of 96 scientific works in these sections. The bulk of these studies is articles, and then come books, book chapters and conference proceedings. In these studies, we tried to figure out the development of the concept of sustainable fashion by using frequency analysis, content analysis, bibliometric analysis and network analysis. To run these analyses, we utilized programs such as Excel, VOS Wiever, and in-Vivo.

Our findings demonstrate that it was in 2008 that the concept of sustainable fashion was started to be researched in research papers. From 2008 to 2012, such research efforts remained steady, but since the year 2012, the number of articles published on sustainable fashion has shown an upward trend. This might prove that the subject of sustainable fashion has increasingly gained importance.

It was observed in the result of our analysis that the majority of the research papers were published by researchers in universities in the USA and Great Britain. It is interesting to note that researchers in China, South Korea, and Hong Kong follow their colleagues in these two countries. On one hand, global companies relocate their production facilities to least developed countries and developing countries to promote fast fashion and benefit from it; on the other hand, there are those who welcome such global companies to their own countries and experience the problems and issues associated with fast fashion.

The results of analysis by type of research methods used in research papers show that qualitative methods are more frequently used in research papers on sustainable fashion. When it comes to the types of qualitative methods, the methods of 'theoretical review and case study' are preferred more by researchers.

Compared to qualitative methods, quantitative methods are in the minority among the papers which constitute the focus of this study. Of these qualitative methods, the survey method is used more frequently, it was observed. Although surveys are the most frequently used method in quantitative methods, it is important to note that there is still a need for a scale created for sustainable fashion perception.

In the following parts of our study, a frequency and content analysis was made in the keywords sections of research papers. The results of frequency analysis show that research papers generally focus on topics related to individual/consumer behavior. The focal point of this study is to examine the attitudes and behavior of customers toward fast fashion and sustainable fashion in the general sense. Then come articles related to management. In this group, there are research studies which demonstrate not only how sustainable fashion as a business model can be integrated in the textile sector and also how to structure production, distribution, marketing etc. strategies of such companies. Papers on subjects related to textile, information technologies, and chemistry constitute the rest of the research.

In the content analysis made with keywords in papers used in this study, the concept of sustainable development was found to be the first concept related to sustainability. The concept "sustainable development" and its scope were first tracked in 1987 in "Our Common Future" (The Report of the World Commission on Environment and Development - WCED) by the United Nations. However, the concept was used very comprehensively (Uzun et al., 2008). As the United Nations held conferences and released reports similar to this in the following years, the content of the concept of sustainable development was understood better. It is also possible to observe this progress in papers on sustainable fashion. In the papers we examined in the following years, more detailed concepts in the keywords of studies on sustainability (sustainable operations, social welfare, sustainability challengers, sustainopreneurship etc.) are found. Consequently, in the following years, finding the sub-concepts of "sustainable development" in the keywords in papers can indicate that the concept of sustainability has been comprehended increasingly better and in the fashion industry it has been researched in greater detail.

Content analyses were supported with bibliometric analyses. In doing so, the concepts mentioned in keywords are examined in relation to sustainable fashion by year. Our findings show that between 2008 and 2020 the scope of keywords in articles on sustainable fashion widened. While, in the early years when the concept of sustainable fashion first emerged, it was studied along with only the concepts of economic sustainability, in the following years the concept of sustainable fashion was studied together with the concepts of social and environmental sustainability. This result is in line with the claim of Liu (2009) that the aspects of sustainability were broadened by encompassing these aspects.

Finally, bibliometric and network analyses of the authors of the research papers and the citations they received were conducted. The results of these analyses show that the author Choi T.-M. published the most research papers in this field. In addition, this author was part of three separate research networks. Choi's studies could be evaluated as pioneering studies about sustainable fashion for the industrial engineering and logistics fields. The paper on sustainable fashion which received the most citations is the collaborative work of Hu et al. (2010), which is their only paper on this subject. Considering this, the paper written by these authors can be claimed to set the direction of future research in chemistry field. McNeil, Ko and Henninger's studies might be accepted as the basic researches for the marketing research within the sustainable fashion framework.

This study was conducted only on published studies, and so it does not include the results of other studies which were carried out but not published in academic databases. In addition, papers which are indexed only in SCOPUS databases among all scientific databases were analyzed and evaluated, creating a limitation of this study. This study encompasses academic studies published till April 2020, when Covid-19 started to affect the whole world negatively. Especially studies published in the second half of 2020 and 2021 clearly show the differences in trends in the fashion industry. In a follow-up study, the way academic studies dealt with the concept of sustainable fashion can be investigated, taking into consideration how Covid-19 pandemic affected the world. Even a comparative study of the results of this study and new ones can be carried out. Furthermore, one of the findings of this study is that a sustainable fashion perception scale is not available and has not still been devised in the academic studies conducted so far. Consequently, in further research studies a behavioral study in order to devise a sustainable fashion perception scale can be done.

# DISCUSSION

In this study, the emergence, growth and importance of the concept of sustainability in the fashion industry were analyzed by examining academic studies on this subject. Acting on the assumption that each research paper investigated the concept of sustainable fashion in the textile industry, the concept of sustainable fashion in the fashion industry was analyzed and evaluated from the perspectives of 96 papers. As a result, it was claimed that the concept of sustainable fashion has been the subject of more research studies. The question is: is sustainable fashion a utopian dream? This question can be answered by giving some examples from the fashion sector.

Many companies ranging from small-scale companies to leading global companies continue to incorporate sustainability into the design and production of their garments. Rant Clothing brand, an Australian eco-friendly clothing firm follows a 3R (reduce, recycle, reuse) strategy in its production line. Rant sells its garments which are made from high quality materials and can be easily combined with other clothes delivered to addresses with recycled packages and containers. It strives to reduce its environmental impact by using renewable energy sources and rainwater. By providing workers with equal pay for equal work, flexible work schedule, and acceptable working conditions, this company has been a sustainable company for its workers. (D'Souza, 2015, p. 70). Another example of a company following the principles of sustainable fashion is Kering, a France-based multinational corporation dealing in luxury products. Its luxury brands promote sustainability in the fashion industry. Stella McCartney created a collection of shoes made entirely of recycled plastic. The company stated that 53% of women's clothing collections and 45% of men's clothing collections became sustainable in 2015. Balenciaga has achieved recycling 3.1 tons of fabric since 2011. Maison Martin Margiela created fashion collections out of broken mirrors, used fabric and shells (Moorhouse & Moorhouse , 2017, p. 1949).

In the market, there are many established companies which continue to operate on the basis of the principles of sustainability. However, the growth of these brands is relatively slower compared with those which promote fast fashion. The leading brands of the sector are abandoning their traditional/fast production strategies gradually and are striving to become brands which promote sustainability. A case in point is Adidas. A vocal opponent of the use of disposable plastic bags for a long time, Adidas put into practice its zero-waste policy through its collaboration with Parley for the Oceans in 2015. It used plastic waste collected and recycled from oceans to produce its Ultraboost model shoes and declared that the company uses 11 bottles of water for the production of each pair of shoes. Adidas is planning on making shoes made entirely of recycled materials till 2024. In 2016, the company made a decision to remove plastic shopping bags from its own retail stores around the world, which resulted in the elimination of roughly 70 million plastic shopping bags. In addition to Adidas, there are many more companies which transform themselves to become sustainable fashion companies (Delmas & Burbano 2011).

The concept of sustainable fashion emerged at a time when consumption increased drastically and reached a point where it became unsustainable. Although it might be perceived as a trend, sustainable fashion has become a necessity considering all the new evolving conditions for all fashion companies (Kılıç, 2013). So far fashion companies have satisfied the desires and expectations of individuals with fast fashion, yet they are now faced with customers calling into question the sustainability of fast fashion. Customers prefer to buy products which are long-lasting, made of dyes and fabric not harmful to health, can be recycled when they are worn out, and do not pose any risk to the environment. The number of conscious customers who, after seeing media coverage, protest the clothing products which harm not only the environment but also

the health of human beings and are manufactured through unethical practices in least developed or developing countries has been increasing day by day. While companies which are aware of these changing times and try to analyze the expectations and wants of customers properly and satisfy them as quickly as possible will continue their economic viability by making above-average profits in the sector, companies which take no heed of this great change will go out of business sooner or later.

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