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Perspective

Apparel Consumer Behavior and Circular Economy: Towards a Decision-Tree Framework for Mindful Clothing Consumption

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Abstract: The apparel consumer, one of the vital stakeholders in the apparel supply chain, has a significant role to play in moving the clothing industry in a sustainable direction. From purchasing and care practice to donation and disposal, every step of their decisions impacts the environment. Various internal and external variables influence those decisions, including culture, customs, values, beliefs, norms, assumptions, economy, gender, education and others. Therefore, we believe having a scientific understanding is very important, because consumers need to be aware of what makes eco-conscious apparel behavior; only then will the circular transition be eased. However, the key concern is whether the apparel consumers are aware of this knowledge or not. Therefore, we formulated a prospective study from a life cycle thinking point of view with a key focus on synthesizing apparel consumer behavior concerning clothing acquisition, maintenance and disposal through the circular economy lens. Hence, a circular economy lens framework is proposed, followed by three research questions' (RQ) formulation: RQ1. What is the current norm of clothing acquisition, maintenance and disposal behavior?; RQ2. Is apparel consumer clothing acquisition, maintenance and disposal behavior circular-driven?; RQ3. What is the sustainable way of clothing acquisition, maintenance and disposal? These questions are followed by circular economy lens framework development for apparel consumers. Second, following the research questions, state-of-the-art literature-driven decisions were gathered to form constructive consumer-centric decisions over the apparel lifecycle. Third, building on this synthesis, a critical discussion is offered, following the decision-tree approach to inform relevant behavioral guidelines for consumers and other stakeholders in the apparel supply chain. Overall, our findings on apparel consumer behavior through the circular economy lens could serve as new guidelines for consumers to exercise mindful clothing consumption behavior.



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Keywords: apparel; clothing industry; apparel consumer behavior; circular economy lens; mindful clothing consumption; sustainable fashion; green fashion; circular textiles; sustainable garments; green consumer; life cycle thinking of textiles; responsible consumption



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1. Introduction

Consumer behavior related to apparel products is mainly associated with acquisition (purchasing), maintenance (keeping, using, and care) and disposition of clothes (everything after the primary owner's use) [1]. Sustainable apparel behavior involves putting social and environmental considerations into clothing acquisition, maintenance and disposal decisions. Thus, the environmentally sustainable behavior of apparel consumers can be understood from three perspectives: eco-conscious acquisition, eco-conscious care and eco-conscious disposal behavior. These behaviors involve a range of psychological equations

guided by one's values, beliefs, aspirations, assumptions, financial conditions, education, family history and culture [2]. Eco-conscious acquisition is guided by consumer awareness, attitude, concern and commitment. Eco-conscious care is determined by the number of uses, laundering frequency, washing methods, drying and ironing methods [3]. Eco-conscious disposal behavior can be understood from the intention to recycle (upcycling and downcycling), donate and reuse, throw away (landfill or incineration) and keep in the closet [2,3]. The most significant environmental benefits are achieved by consuming less (i.e., responsible consumption) and extended use of garments, broadly falling under the core principles of the circular economy. Consumer has direct control over consuming less, extended use and sustainable care practice. Outside consumers' direct influence, the other sustainable options are rechanneling, recycling, energy recovery from incineration and landfilling. Out of all these, landfilling (throwing away) is the worst of all types of clothing's end-of-life fate [4]. However, consumers can influence the fate of the unwanted apparel by being responsible in disposition (for example, donating or dropping in collection bin). Therefore, responsible consumer behavior is vital to realize a circular vision across the supply chain.

However, today, clothing consumers are fast fashion-oriented; this started around the early 2000s [3,5]. Cheap and low-quality materials characterize fast fashion. Due to cheap, poor-quality materials, apparel loses its appeal quickly. At the same time, due to the rise in purchasing power, consumers can afford to buy new clothes many times a week. By swiftly offering new collections and crafting planned obsolescence, brands allure consumers to refill their wardrobes by throwing away used clothes that still have their useful life left. Along with them, brands' attractive marketing strategies, traditional and social media, opinion leaders, bloggers, celebrities and peers play an essential role in influencing consumers to consume fast fashion [6,7]. As a result, clothing consumption has doubled in the last decade, whereas consumers keep clothing half as long as they did 15 years ago [8]. Their usual apparel purchasing decisions are mainly driven by fit, color, style, durability and easy care [9]. Mainstream consumers do not care about the dark side of clothing (i.e., how it impacts our environment and society). One of the main reasons for this behavior is that the clothing supply chain is complex, and consumers have a poor understanding of climate change issues and the underlying science associated with them. Lately, circular economy as a concept for managing resources and mitigating climate change issues was suggested [10]. Since then, it has become a mainstream strategy in the framework of waste management, particularly concerning different products and waste streams [11]. Nevertheless, some concerns been expressed; these are mainly related to monitoring and evaluating waste prevention activities, which are very critical [12]. The apparel sector, also facing such concerns, needs critical waste prevention activities.

Why Circular Thinking Is Important for Apparel Consumers, and Key Contributions

Today, most consumers lack an understanding of how clothing is made, and the impact of their consumption [13–15]. They have limited knowledge of sustainable care practices [16]. They also have a poor understanding of how their disposal behavior affects the environment negatively [17]. They do not know where to dispose of clothing, or how [18]. Therefore, it is important to examine what factors influence apparel consumers' eco-conscious behavior and what behavior guidelines can be made. While previous studies have identified the factors influencing eco-conscious apparel acquisition [14,15], care [19,20], and disposal behavior [17,21], no previous study has synthesized this information for consumers to holistically understand their sustainable apparel behavior. Moreover, previous studies fell short in providing consumers with straightforward guidelines, without a vision of what makes eco-conscious acquisition, care of and disposal of clothing. Though circular economy thinking from the perspective of apparel consumers is articulated in the literature [22–26], only a few studies have comprehensively explored this concept. For instance, a "sustainability bias" has emerged, through assessing consumer attitudes towards the fashion sector from the perspective of the bioeconomy and the circular economy [23,24].

The circular premium concept promotes circular strategy in the fashion industry by bringing all the stakeholders under one roof with a clear vision for transition [25]. Very recently, Papamichae et al., 2022 presented a study on building a new mindset in tomorrow's fashion development, wherein they suggested that this should be through circular strategy models, and introduced a clear vision and new strategy involving customers, businesses, and policymakers [26]. From these very recent studies, it is obvious that consumer involvement is crucial, raising questions such as 'Is the consumers' mindset based on scientific understanding of the circular economy?', and 'To what extent do consumers consider circular fashion?' The answers to these questions are still debatable and have no solid evidence. As a whole, it is clearly seen that consumers lack proper scientific understanding and relevant guideline. We believe having a scientific understanding is very important, because consumers need to be aware of what makes eco-conscious apparel behavior; only then will the circular transition be eased. Therefore, we formulated a prospective study from a life cycle point of view, with a key focus on synthesizing apparel consumer behavior concerning clothing acquisition, maintenance and disposal through a circular economy lens.

To realize the proposed aim, three research questions (RQs) are formulated:

RQ1. What is the current norm of clothing acquisition, maintenance and disposal behavior?

RQ2. Is apparel consumer clothing acquisition, maintenance and disposal behavior circular-driven?

RQ3. What is the sustainable way of clothing acquisition, maintenance and disposal?

The key contribution of this study is the understanding of the apparel consumer behavior under the circular economy lens framework and decision tree approach, followed by a synthesis of state-of-the-art literature-driven decisions of apparel consumer behavior concerning clothing acquisition, maintenance and disposal to inform relevant behavioral guidelines for consumers and other stakeholders in the apparel supply chain.

2. Framework and Methodology

2.1. Circular Economy Lens Framework for Apparel Consumers

The circular economy lens framework shown in Figure 1 for apparel consumers is formulated to better understand consumer behavior related to apparel products mainly associated with three things: 1. Acquisition (purchasing), 2. Maintenance (keeping, using, and care), and 3. Disposal (everything after primary owner's use). Figure 1a shows the general consumer psychology framework where there is a dual possibility, i.e., consumers may or may not have a solid understanding of circular economy principles. The framework in Figure 1b drives consumers' psychology, mainly with scientific understanding of the circular economy with appropriate awareness. Hence, the key difference between the proposed and apparel psychology framework in ref [1] is broader understanding of circular economy principles, such as 'regenerate nature', 'minimizing or eliminating waste', 'eliminating pollution', 'circular products', and 'circular materials'-related decisions among consumers, who play a significant role in moving the apparel industry towards a sustainable path.

2.2. Methodology

Based on the framework presented in Figure 1, a keyword search methodology was adopted for carrying out the critical study. First, a brainstorming discussion was performed at the authors' level in multiple sessions to select the keywords while keeping the research questions (RQ1, RQ2, and RQ3) in mind, followed by verification and improvements with expert's opinions. The contacted experts broadly fall under the category of consumers with some awareness, textile production and recycling industry personnel, non-profit advocacy teams and other senior figures in the subject area from academia. The selected keywords include 'sustainable apparel(s)', 'sustainable clothing industry', 'apparel consumer behavior', 'circular economy in textiles', 'mindful clothing consumption', 'sustainable fashion', 'green fashion', 'circular textiles', 'sustainable garments', 'green clothing consumer', 'life cycle thinking of textiles', 'responsible clothing consumption'. These are used in line with the circular economy principles keywords, as shown in Figure 1b.

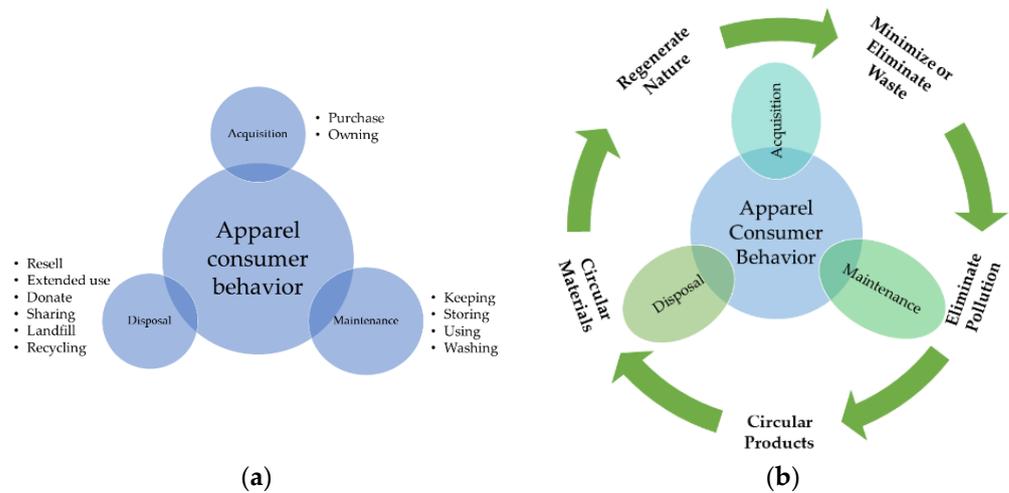


Figure 1. Framework for understanding consumer clothing behavior, (a). General consumer psychology framework; (b). Circular economy lens framework for apparel consumers.

Second, these keywords were used in various databases (including Google Scholar, Web of Science, ScienceDirect, Scopus and other related databases of gray literature). Third, the obtained articles from the keyword search are further filtered and processed to pick the most relevant literature for this study. Additionally, duplication in the articles between the indexed databases was removed. Fourth, the filtered articles were grouped per the consumer psychology framework categories, i.e., clothing acquisition, clothing maintenance, and clothing disposal. Fifth, these articles were studied critically under three groups for addressing the RQ1, RQ2, and RQ3. The detailed steps of the methodological process of the review are shown in Figure 2.

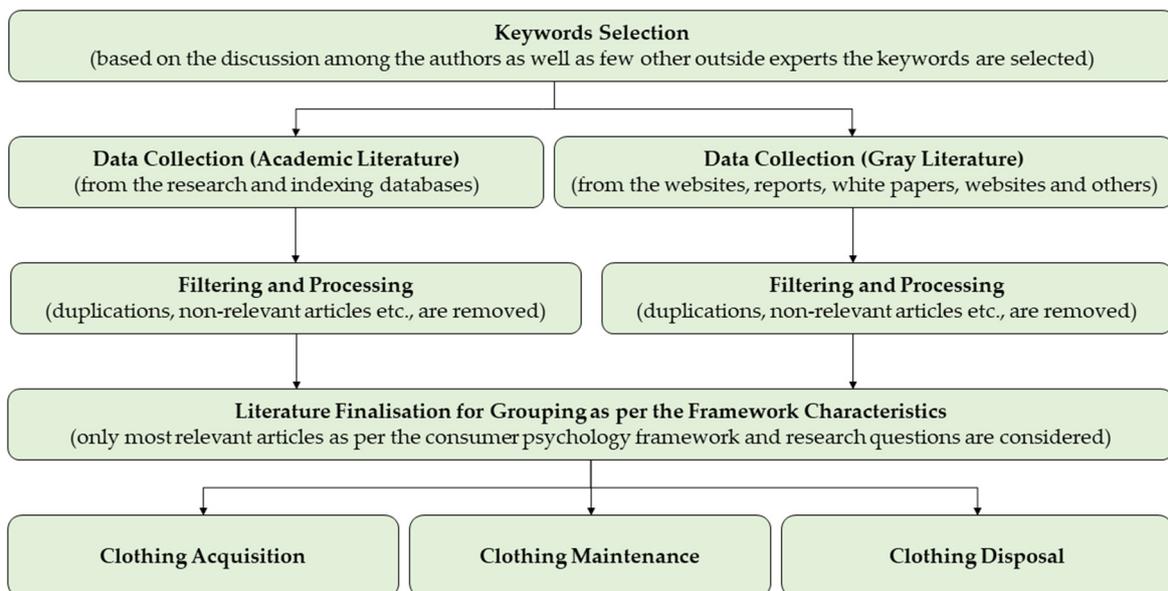


Figure 2. Literature review methodology showing the data collecting process.

3. Results and Discussion

From the literature review, the brief answers to the research questions are that the current form of clothing acquisition, maintenance and disposal behavior is not sustainable, even among highly knowledgeable consumers, suggesting a lack of life cycle perspectives and circular thinking. It is also clear that there is no standard sustainable way that is

followed among consumers in terms of clothing acquisition, maintenance and disposal. In the below sections, our findings are explained in detail, along with the discussion leading to mindful clothing consumption.

3.1. Clothing Acquisition

Consumer knowledge and awareness of sustainable apparel influence their purchasing decisions. However, it is not true that highly knowledgeable consumers will always buy sustainable clothing. There exist many other factors that impact the decision. For example, a knowledgeable consumer might have a financial limitation in buying sustainable apparel (by paying a higher price) [19]. Moreover, it is difficult for consumers to research and identify sustainable clothing during their purchase. Often, they rely on their perception of the brands they are purchasing from, and justify their purchase on the basis of the reputation of those brands [19]. As Harris et al. [15] mentioned, consumers fall short of demonstrating sustainable behavior because (1) clothing sustainability is complex, and consumers lack knowledge, (2) consumers are diverse in their concerns, and (3) sustainability is less important in consumer purchase decision criteria.

Concerning obstacles, Hiller Connell [14] identified two internal and four external barriers. Internal barriers include knowledge about eco-conscious apparel acquisition (ECAA) and attitudes about environmentally preferable apparel (EPA), while external barriers include limited availability of EPA, economic resources, less enjoyable secondhand stores and society's expectations. Consumers have limited knowledge of what materials are more environmentally friendly, how apparel is manufactured and its associated impact on the environment. On the other hand, spending extra money, putting extra work into acquiring EPA, and less social acceptance play their part in consumers not purchasing EPA. Likewise, consumers perceive financial, performance-related, psychological and social risks while making responsible decisions [27]. While forming purchase decisions, consumers carefully consider possible monetary loss, functional deficit, compromise of self-image and social unacceptance.

Among the enablers, ethical commitment to apparel purchase and ethical values were mentioned by Niinimäki [28]. However, product attributes are key to attracting consumers to buy EPA [14,28]. If EPA cannot compete with fast fashion in terms of attributes and price, the process of consumer acquisition of EPA would be slow. Creating competitive, sustainable fashion that has the same appeal as fast fashion is easier than making consumers aware of environmental issues and driving them to act. Six overarching values drive consumers' sustainable apparel acquisition: self-expression, self-esteem, responsibility, protecting the planet, sense of accomplishment and social justice [29]. On the other hand, consumer knowledge of green industry initiatives and green brands, beliefs relating to corporate responsibility, subjective norms, motivation to research, search and buy green apparel and attitudes toward purchasing green clothing were found to influence purchase intention and purchase behavior of green textiles and apparel [30]. Consumer demography (i.e., geography, age, etc.) influences sustainable clothing purchases [31]. For instance, younger consumers show more favorable attitudes toward environmentally responsible clothing consumption [32]. Consumers' belief that they can positively impact the environment through their buying of sustainable apparel (a term called 'perceived consumer effectiveness') positively impacts the purchase intention of sustainable apparel [33]. Additionally, consumers' belief that a particular product matches their personal style and value (a term called 'perceived personal relevance') positively impacts the purchase intention of sustainable apparel [33]. Similarly, the subjective perception of ease or difficulty of engaging in any behavior (termed 'perceived behavior control') is associated with sustainable apparel purchases [34].

However, as stated earlier, environmental knowledge does not often translate into behavior [35]. For example, a study found that understanding clothing production's environmental impact did not positively influence environmentally friendly consumption behavior [36]. Similarly, peers' sustainable choices may not influence purchase decision-

making [37,38]. Therefore, it is understandable that knowledge, values, beliefs, attitudes, commitment, subjective norms, demographics, external factors and different types of internal and external barriers play a significant role in consumer intention and decision-making toward acquiring EPA. These variables can drive consumers to purchase sustainable apparel in favorable circumstances.

As shown in Figure 3, consumers perceive various risks, hold different values, face many barriers and are driven by many enablers. Subjective norms (i.e., peer pressure), product attributes and brand reputation also play an important role in consumers' purchase decisions. For instance, while perceiving the financial risk of acquiring EPA (i.e., in relatively costlier products), consumers demonstrate poor intention to purchase. Similarly, the bad reputation of EPA brands leads to poor intention to purchase. Conversely, consumer knowledge of the environmental impact of clothing production, positive attitudes towards EPA and higher subjective norm score lead to higher purchase intention. From the above discussion, it is evident that there needs to be an interplay of many favorable factors in order for consumers to make EPA purchasing decisions. However, it can reasonably be said that consumer knowledge of the environmental impact of products, their attitudes towards purchasing EPA, willingness to research and ability to afford are the main drivers of sustainable clothing acquisition [31]. These drivers might also be the precursor of other enablers (such as perceived consumer effectiveness) and personal values [31].

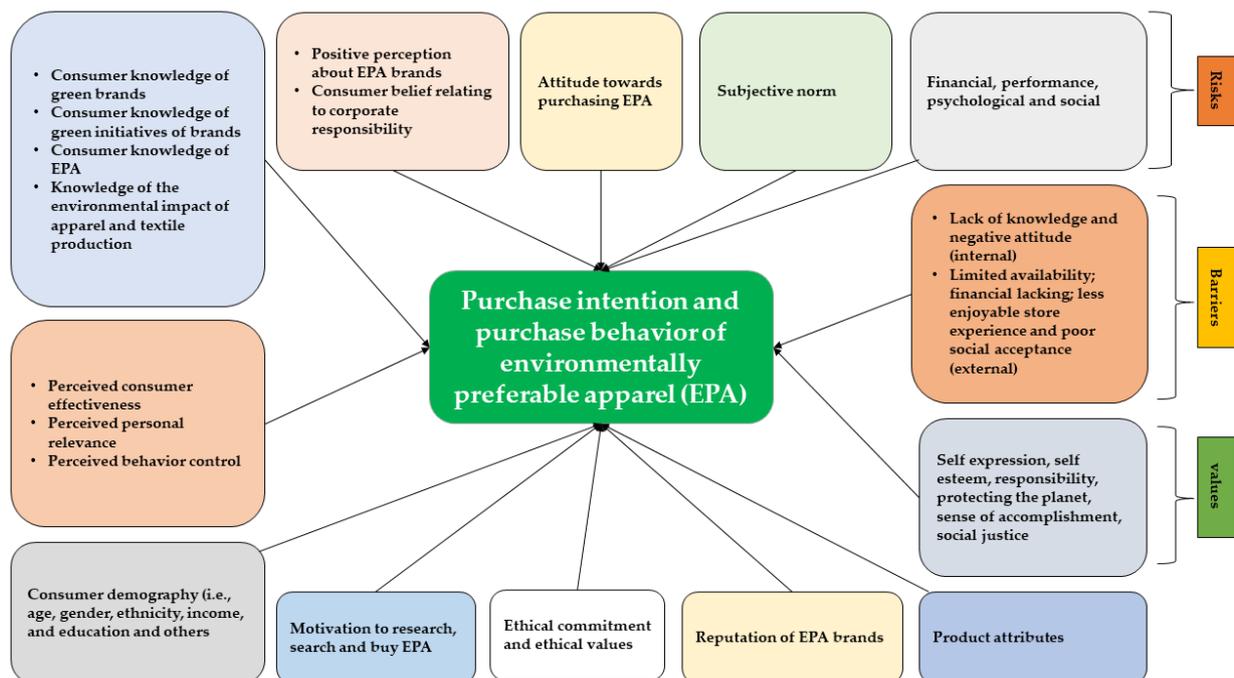


Figure 3. Factors affecting sustainable clothing acquisition. Authors own compilation based on referred literature [19,27–31,33–36,38].

3.2. Clothing Maintenance

Clothing maintenance is a significant environmental hotspot for many clothing types (such as cotton) [16,39]. Laundering culture and frequency are the main defining factors of clothing maintenance. Clothing maintenance is mainly influenced by everyday habits, customs, social norms and culture [21,40]. Most consumers do not know the impact of their clothing maintenance activities. A very negligible portion of consumers might see the impact; however, they do not necessarily act due to the attitude–behavior gap and lack of infrastructure. The attitude–behavior gap exists where consumers have the knowledge, but cannot act due to various internal and external limitations. On the other hand, lack of infrastructure also hinders sustainable behavior. For example, in most developing countries,

such as India and Bangladesh, hand washing and line drying are prevalent. Therefore, the reduced impact from clothing maintenance of those consumers is due to social norms and infrastructure, rather than awareness. On the other hand, machine washing and drying are the social norm in the United States and other developed countries. As a result, the environmental impact of consumer clothing maintenance is simply a result of cultural norms.

A slight modification of consumer behavior in the use phase might bring significant environmental benefits. For instance, the elimination of tumble drying and ironing along with washing in low-temperature settings might lead to a 50 percent reduction in the global climate change impact of clothing products [16]. A lot of other factors determine the environmental effects associated with clothing care, for example, types of clothing cared for, lifetime number of washes, washing machine type (i.e., efficiency, front-loading/top-loading), washing machine setting (i.e., cold or hot), geographical location, cultures, etc. [16,39,40]. In the case of an automatic washing machine, the environmental impact is determined by the machine type (i.e., horizontal vs. vertical loading), age of the machine, temperature setting, load size and the number of washes. In contrast, the impact of manual washing is determined primarily by the water and chemicals used. The wash cycles vary by country and size of the household, and so do the energy and water consumption. Japan was found to carry out the most significant number of wash cycles per household, followed by North America and Australia [40]. The average water consumption per washing cycle also varies by the type of washing machine used. The vertical axis machine requires twice as much water as the horizontal axis machine per cycle. Water consumption per wash cycle is the highest for North America, followed by South Korea and Japan [40]. Electricity consumption per wash cycle was found to be greatest for Turkey, followed by East Europe, West Europe and North America [40]. The annual electricity consumption per household for North America from clothing wash was reported as about 124.3 kWh [40]. This variation in wash cycles and energy and water consumption suggests that different kinds of interventions are needed for different geographical locations to make clothing care habits sustainable. Changing consumer clothing care practice is not easy, but rather ingrained in multiple layers of knowledge, cultures, habits, customs and geography.

Furthermore, benchmarking the environmental impact of clothing care requires knowing the number of times consumers wash different types of apparel. Most literature assumed either 25 or 50 wash cycles [16,39,41]. However, in order to update the data, Daystar et al. [3] surveyed 6000 respondents from China, Germany, Italy, Japan, the United Kingdom and the United States to characterize the use of T-shirts, knit collared shirts and woven pants. They determined the global average of total washes per lifetime as 17.3, 22.2, and 23.5 washes for T-shirts, knit collared shirts and woven pants, respectively. Therefore, it seems that the assumption of 25 cycles is logical. The average first-life use period was determined as 37, 40, and 42 months for t-shirts, knit collared shirts and woven pants, respectively. This result suggests a greater overall maintenance impact for the T-shirt as it has a shorter lifetime. Still, diverse types of apparel and more geographical locations need to be included in future studies to upgrade the global average. In addition, a detailed analysis of the environmental impact of consumer clothing maintenance activity is needed. Such analysis should consider a variety of existing washing machine types, their settings and variation in consumers' maintenance habits.

3.3. Clothing Disposal

Waste generation from throwaway clothes is a big problem that has its root in fast fashion. Fast fashion is produced in shorter lead times, typically made with low-quality and inexpensive materials and built-in planned obsolescence [3,5]. The low price of garments and increased individual purchasing power entices consumers to buy a lot of fast fashion, often impulsively [42]. However, they lose interest in the products quickly because of fast fashion's low quality and obsolescence. As a result, most of these items are thrown away long before their actual usability ends; this is termed "throwaway culture" [18]. The

average American throws away 82 pounds of clothes yearly [43]. In 2015, the United States generated about 16 million tons of textile waste, of which 65.7% went into landfills, 19% to the incinerator, and 15.3% was recycled [44]. An average UK consumer throws away about 66 pounds of clothing and textiles (a total reported as 2.35 million tons), of which 74% go to the landfill, 13% to incinerators and 13% to material recovery [16]. The average European Union consumer generates 57 pounds of textile waste [45]. Globally, 91 million tons of clothing are thrown away yearly; this is equivalent to one garbage truck of clothing every second [46]. The environmental cost of this massive amount of clothing waste is enormous in terms of groundwater pollution (from leachate), greenhouse gas (GHG) emissions and land occupation.

Three scenarios might arise during consumer decision-making of garment disposition: (1) keep it (i.e., reuse, downcycling, etc.), (2) permanently dispose of it (throwaway, giveaway, etc.), and (3) temporarily dispose of it (loan, rent, etc.) [1]. Based on Jacoby's [1] classification, the factors impacting the decision to dispose of garments can be grouped into three categories: psychological attributes of the decision-maker (personality, attitudes, learning, etc.), the intrinsic value of the product (condition, fit, durability, etc.) and factors extrinsic to the product (finances, fashion change, legal, etc.). Table 1 presents the key factors affecting clothing disposal behavior [10], as published in literature from 1980–2013.

Table 1. Factors affecting clothing disposal behavior.

Agenda	Focus
Destinations	Mainly focuses on where clothes go after disposal. Primary channels identified as charity, giving away to friends and family, donations, etc.
Motivations	Focuses on the reasons behind choosing specific disposal methods. The main motivations identified are the convenience of recycling, donating as a form of helping others and social and environmental concerns.
Disposal reasons	Focuses on why consumers dispose of their garments. Disposal reasons can be categorized into wear and tear, fit or size, fashion, taste or boredom, and other reasons.
Demographics	Focuses on the effect of gender differences on clothing disposal behavior.

However, there is a research gap in understanding the clothing disposal behavior of consumers. A recent study by Bernardes et al. [47] reviewed 51 studies concerning clothing disposal behavior. They reported that studies mainly examined how clothing is disposed of, not why they disposed of them. Based on their review, they proposed immediate investigations in four research directions: (1) investigating the decision-making process of consumers' clothing disposal, (2) examining sustainable disposal behavior, (3) exploring external factors, and (4) improving the current methodology of understating the issue. Nevertheless, changing consumer behavior related to discarding clothes and waste generation is challenging. The problem is ingrained into cultural, social, and national practice, and it requires both individual and institutional efforts to bring the desired change. Clothing disposal is a vital consumer behavior because disposal creates the demand for consuming virgin materials, along with incurring a significant environmental cost. Thus, responsible behavior in the disposal phase involves actions associated with diverting waste from landfills or incinerators through repairing, donating, reusing, repurposing and recycling.

3.3.1. Clothing Donation

Studies reported both self-oriented reasons and others-oriented reasons behind clothing donations [48]. Self-oriented reasons are freeing up closet space, and remaining guilt-free [44,49] and others-oriented reasons are social and environmental concerns and helping others [50,51]. The primary motivation for donating clothes is to free up closet space [49]. Cloth donation is not primarily influenced by social consciousness, and consumers do not regard donating clothes as valuable as donating money or food [49]. Consumers keep

expensive and high-quality items as long as they can. They try to donate those items they do not want to keep anymore. They throw away those items even after one-time use, long before their useful life ends [18]. The subjective evaluation of the quality of the garment and the sentimental value attached to it play a significant role in deciding what to donate and what not to donate. If the sentimental value is higher, consumers tend not to donate the item regardless of physical condition, for example, an item that reminds a memory or incident. Consumers also hesitate to donate intimate items, for example, underwear [49]. Consumers feel guilty about how much clothing they own and their limited use of them [49]. Putting in environmental terms, Morlet et al. [46] reported that the clothing industry loses nearly USD 500 billion each year due to the un-utilization of clothes.

During donation, consumers choose close family members and friends as their first choices [49]. Charity donation is another common method of sustainable clothing disposal [18]. The convenience of the donation channel is an important factor in determining where the clothes would be donated [49]. Through the overall act of donation, consumers gain both hedonistic (i.e., good feeling) and utilitarian value (i.e., freeing up closet space) from donating clothes [49].

On the other side of the spectrum, a consumer who shops for donated clothes from secondhand, thrift store, and vintage shops presumably does so for both self-oriented reasons (to look different and unique) and others-oriented reasons (economy, sustainability and recycling) [52,53]. There exist attitudinal and contextual barriers to acquiring secondhand apparel [54]. Attitudinal barriers include consumers' evaluation of secondhand shops as unhygienic, unattractive, less socially desirable, etc. In contrast, contextual barriers include unappealing store ambience, unattractive product offerings and the price mix [54]. Among the motivations, waste-efficiency and economy were found to be important [55]. Whatever the case, secondhand clothes need to compete with mainstream fast fashion products to fulfill the basic attributes of clothes, such as price, style, fit and attractiveness.

Donation is important for extending product life. Extending product life potentially saves virgin materials and reduces waste. Previous studies estimated the extent of saving new items from secondhand use of clothing. For instance, Patwary [56] estimated that using 100 pieces of secondhand clothing could substitute between 63–73 pieces of new clothing for US consumers. Based on this substitution rate, the study reported that reusing 100 pieces of 100% cotton t-shirt may reduce an estimated 1.48 kg CO₂, eq. of greenhouse gas (GHG) emissions. Similarly, Nørup et al. [57] estimated that every 100 pieces of secondhand clothing used substitutes around 45 pieces of new clothing. In the case of the United States, clothing donation might potentially divert 10 million tons from landfills and 3 million from the incinerator, assuming those clothes were still in their useful life [44]. Considering the global scale of textile waste, the number would still be significant if 10% of all textile waste were still in usable condition. Therefore, clothing donation should be encouraged.

3.3.2. Clothing Reuse and Recycle

The prolonged use of a garment can potentially reduce the overall environmental impact of the supply chain. Prolonged use can be direct reuse after mending or repairing, or reuse by others through sharing/donation, as long as the products retain some value throughout it. Prolonged use of garments would reduce the associated manufacturing need and hence minimize environmental impact from the production phase. Allwood et al. ([16], p40) reported, "Extending the life of clothing so that demand for new products is reduced by 20% leads to a reduction of about 20% in all measures in the producing country". Other studies also reported the highest energy and CO₂ equivalent savings from the direct reuse of clothing [56,58]. Reducing clothing requiring 1 kg of virgin cotton fibers through secondhand clothing or reusing might save 65 kWh. In the case of polyester, it might save up to 90 kWh [59]. This suggests that establishing a reuse mechanism for synthetic fibers (i.e., polyester, nylon) is more important than natural fibers. Fisher et al. [58] estimated the environmental benefit of reusing cotton t-shirts and woolen jumpers in the UK. They reported that direct reusing (e.g., from a charity shop and eBay) saves

approximately 6.6 lbs. CO₂ eq for a cotton t-shirt and 8.8 lbs. for a woolen jumper. Sandin and Peters [60] reviewed the published literature focusing on the environmental impact of textile reusing and recycling. Their review lent strong support to the idea that reuse and recycling are better choices than incineration and landfill, with reusing being a better option than recycling. However, there are cases where reusing and recycling might not be environmentally beneficial. For example, if the use of recycled garments does not reduce the purchasing of new clothes (i.e., low replacement rate), if the recycling is powered by fossil energy and if the avoided production as a result of the reuse is environmentally clean.

4. Towards a Decision-Tree Framework for Mindful Clothing Consumption

Mindful clothing consumption is essential as it reduces the burden of waste from overconsumption. It was observed from the results that clothing acquisition does not solely depend on life cycle or circularity thinking, as there were many other factors that influenced consumers. On the other hand, sustainable clothing maintenance seems to be relatively more doable among consumers, if provided with the right information and proper infrastructure. The following steps might be recommended to provide simple instructions for sustainable clothing maintenance, as they are observed to play a critical role in extending the useful life of the clothing [40,61].

- Wash less if you can
- Utilize the full load of the machine
- Use a cold setting (30 degrees or less)
- Use liquid detergent (because it is less abrasive)
- Use softener (because it reduces friction)
- Reduce spin speed (it provides less agitation)
- Dump lint fibers into the bin, not in the sink

Besides, extending clothing's lifetime is vital as it reduces the need to buy new clothes. During the care phase, consumers should wash less, utilize a full load of the machine, use a cold temperature setting (30 or less), select the right detergents (i.e., liquid detergent), use softener (to reduce friction and fiber breakage), reduce spin speed, empty residual lint into a bin (not in the sink) and finally, air-dry clothes. If clothing loses its appeal to the primary consumer but still has its useful life left, it should be channeled to others for reuse (donate, swap, garage sell, etc.). Giving away to needy family and friends is a better option than putting garments into donation and recycling bins. The less the clothes travel to be reused, the better. For example, collecting garments from U.S. households and then sorting them in and selling them in the USA is better than collecting garments from the USA and sending them to be sorted and sold in some African countries. If a garment cannot be directly reused, it should be recycled (either upcycled or downcycled).

It is obvious that consumers need to be knowledgeable and responsible. In every stage of their consumption, from acquisition to disposal, they need to go through a decision tree that can be linked to seven forms of sustainable clothing, (1) on-demand and custom-made, (2) green and clean, (3) high quality and timeless design, (4) fair and ethical, (5) repair, re-design and upcycle, (6) rent, lease, and swap and (7) second hand and vintage [62]. Besides, consumer decisions should be guided by the 7Rs of fashion: reduce, rent, repair, repurpose, recycle, reuse and resell [63]. First, consumers need to be mindful of consumption (i.e., asking if consumption is necessary). Second, they should rent from clothing banks or other channels if possible. Third, they should perform a minor repair if that extends the functional life of the item. Fourth, if repairing compromises functionality, they should repurpose the item (such as creating other products through upcycling or downcycling). Fifth, they should channel it to recycling if they cannot repair or repurpose it (because of a lack of skills, financial resources or other things). Sixth, if they do not have any emotional or functional attachment to the product, they should resell it or finally donate it for others to reuse. Based on the above discussion, the following decision tree shown in Figure 4 can be produced for consumers and other relevant stakeholders as related to sustainable clothing consumption.

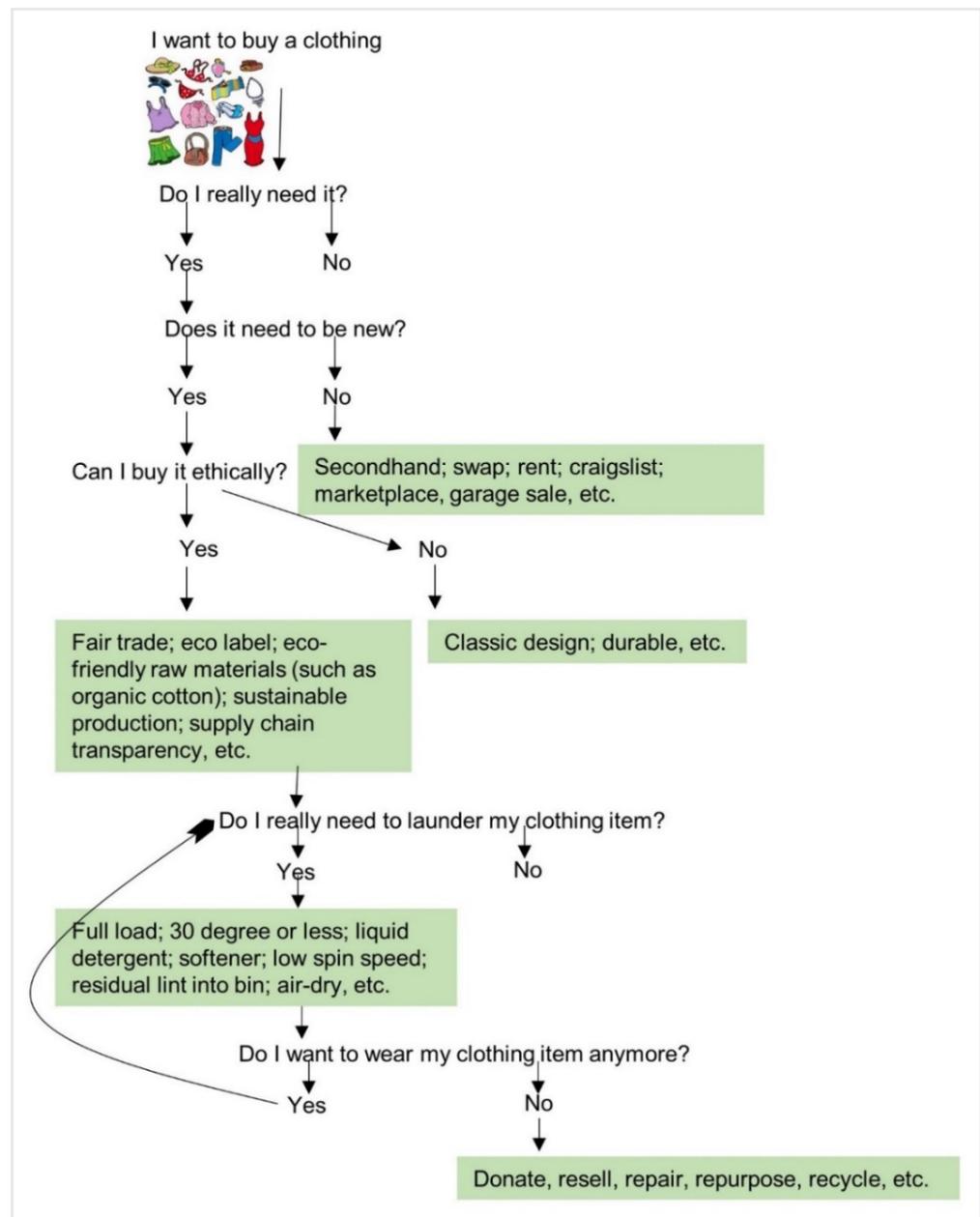


Figure 4. Decision tree for sustainable clothing consumption. Authors own creation following Parischa's study in reference [64]. The green color represents sustainable consumption practices.

Needless to say, it is challenging to change consumer habits. Unless consumers are environmentally concerned and have available resources (in terms of money, time, willingness, policy, incentive and infrastructure) to act, it is difficult for them to adopt sustainable practices. Particularly, changing clothing care behavior would be challenging unless they realize the real impact of their behavior (for example, if the electricity bill goes up significantly, or they need to pay for the water they use to wash clothes). If consumers understand the difference in their clothing care practice in terms of money, labor and time, they might change their behavior. So, consumers need to be educated about the benefit of sustainable care practices both in monetary and environmental terms [21]. Additionally, improved technology can offer options to reduce the environmental impact of laundering; however, it would always be in the consumers' hands to choose those technologies and their useful options. Therefore, consumers are key in reducing the environmental impact of the care phase [65].

Above all, consumer knowledge of the impact of clothing is considered ‘the best hope for sustainability’ in the clothing industry” ([66], p. A454). Therefore, they need to be educated on how to acquire, care for and dispose of clothing sustainably. Alternatively, a brand-focused mindset of consumers might help to deal with a lack of knowledge [21]. For instance, if brands are held liable to produce apparel sustainably, consumers can easily follow any brand without dealing with complex knowledge of sustainability. This approach seems easier than changing the habits and norms of consumers because brands and retailers operate within specific policy frameworks. Egels-Zanden and Hanson [67] found that improved company transparency positively impacts consumer willingness to buy products from that company. Therefore, if consumers purchase from a sustainable and transparent brand, they can rest assured to some extent. A report published in 20220 by McKinsey & Company and Global Fashion Agenda also suggests the same on how fashion industry should act, and how consumers should purchase to urgently cut the greenhouse gas emissions [68]. However, this comes with a clear understanding of opportunities and policy implications for the industries [69]. By doing so, value chain flexibility can be achieved, which ultimately favors the metrics related to sustainable development goals. Nevertheless, a sector-wise ethics and sustainability guideline needs to be set up by the legislating body, because an individual initiative might put a brand at a disadvantageous position [21]. Among all three perspectives of sustainable clothing behavior, it seems that it would be easier to bring a change in sustainable clothing care behavior than purchasing and disposal [21]. However, barriers to sustainable clothing are ingrained at an individual level, social and cultural level and industry level [15]. Therefore, it is not possible to bring change overnight. It would take interventions on all three levels, and obviously, it would be a slow process.

5. Conclusions

This study reviewed published studies to synthesize the existing body of knowledge related to sustainable clothing consumption behavior. We synthesized studies into three main phases of clothing consumption: acquisition, maintenance and disposal. While reviewing relevant information, the study examined typical clothing consumption behavior and sustainable approaches. It is understood that the current form of clothing acquisition, maintenance and disposal behavior was not sustainable even among the highly knowledgeable consumers, suggesting the current patterns are not circular and we need many efforts to make apparel consumers better understand the good practices. It is also clear that there is no standard sustainable way that is followed among consumers in terms of clothing acquisition, maintenance and disposal. Building on the synthesis, we provided a decision tree for guiding consumers to exercise sustainable clothing consumption behavior. Therefore, it is not possible to bring change overnight. It would take interventions at the individual, social, cultural and industry levels, and obviously, it would be a slow process. Additionally, it is observed that consumer behavior is dynamic, so we believe future studies should update the decision tree as new knowledge emerges. Additionally, studies should test the decision tree to educate and measure consumer knowledge of sustainable clothing consumption.

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