

Article

Wardrobe Management Apps and Their Unintended Benefits for Fashion Sustainability and Well-Being: Insights from User Reviews

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Abstract: Global clothing production and waste continues to increase while garment utilisation is decreasing. Many consumers wear only a fraction of the clothing they own, often forgetting or overlooking items already in their wardrobes. This disconnection from existing garments encourages unnecessary purchases and contributes to the environmental and psychological burden of fashion overconsumption. The purpose of this study was to explore the role of wardrobe management apps (WMAs) and their potential for reducing fashion overconsumption. This paper has two core aims: first, to assess how WMAs contribute to sustainability through organisation, extended use, and behavioural change, and second, to examine their emotional and practical benefits for users. A content analysis of 27 WMAs was conducted alongside a thematic analysis of all 5953 user reviews from Apple and Google Play stores. Our analysis showed that 470 users reported behavioural shifts related to reduced overconsumption and increased garment utilisation, while a further 210 users described psychological benefits such as improved mental clarity and reduced anxiety. These results demonstrate the potential of WMAs to support more sustainable fashion habits and enhanced consumer well-being, offering a digital means to promote responsible consumption and align with the UN Sustainable Development Goals, especially SDG 12.



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Keywords: fashion sustainability; digital tools; consumer well-being; wardrobe management apps; behavioural change; overconsumption; circular fashion

1. Introduction

The fashion industry is one of the largest and most internationalised business sectors in the world, generating significant economic value but also incurring considerable environmental and social costs [1]. Since 2010, repeated public scandals, industrial disasters, and growing awareness of climate and labour issues have led to increasing scrutiny of the fashion sector's unsustainable practices [2,3]. Despite technological advances that have made textile manufacturing less resource-intensive, such as cleaner production techniques or advanced waste treatment [4], the overall impact of the industry continues to rise. The increasing environmental harm is due to relentless growth in production volumes, which outweighs the gains made through improved per unit production efficiency [5,6]. The production and disposal of clothing have reached unprecedented levels. Up to 150 billion garments are produced annually, with an estimated 92 million tonnes of textile waste generated each year [7,8]. A significant proportion of these garments are of low quality and limited durability, leading to short usage cycles and rapid disposal [9]. In addition, clothing

is unevenly distributed across global markets, with surplus items often becoming waste or languishing unsold instead of being effectively reused, redistributed or recycled [10]. Therefore, while continued technological advancement is essential, it is insufficient on its own to counteract the escalating environmental impact caused by increased textile production volumes.

1.1. Problem Statement

Global clothing sales doubled between 2000 and 2015, while the average number of wears per item dropped by 36% [9]. These trends have accelerated unsustainable consumption patterns in which garments are frequently acquired but rarely worn. Although estimates vary, there is a broad consensus that excessive production, low prices, and underuse of clothing are key contributors to the fashion industry's environmental footprint. Addressing this issue requires systemic interventions at both the production and consumption levels. While much attention has been paid to improving product 'sustainability', less focus has been placed on changing individual consumption behaviours, particularly how consumers engage with their existing wardrobes.

Altering consumption patterns remains a difficult task. Many consumers continue to buy clothing impulsively or excessively, despite the known financial and emotional consequences. Overconsumption of fashion has been linked to mental health challenges such as anxiety, low self-esteem, and compulsive shopping behaviours [11,12]. At the same time, the growing visibility of minimalism, slow fashion, and second-hand economies indicates that some consumers are open to changing their habits, if supported by an accessible and motivating approach [13–15].

In this context, digital interventions such as mobile apps offer promising new pathways for enabling behavioural change. Just as health and fitness apps have been shown to support users in tracking behaviour, setting goals, and achieving lasting lifestyle improvements [16,17], wardrobe management apps (WMAs) may help consumers reframe their relationship with clothing. These apps typically allow users to create a digital version of their wardrobe, track what they wear, receive outfit suggestions, and could include features that support reuse, resale, and wardrobe reflection [18]. By fostering greater visibility of what is owned and encouraging intentional interaction with existing garments, WMAs may reduce impulsive purchases and help shift users towards more sustainable wardrobe practices.

1.2. Research Aim and Scope

This study investigates the often-unintended benefits of WMAs for fashion sustainability and consumer well-being. Specifically, it explores how WMAs may help reduce fashion overconsumption and extend the use of garments, while also examining their influence on users' emotional satisfaction, decision-making, and mental clarity. To achieve this, the research combines a content analysis of 27 active WMAs with a thematic analysis of their 5953 user reviews from the Apple and Google Play stores, focusing on behavioural, emotional, and functional responses to app usage.

The research is guided by five questions:

- RQ1: What is the current state of user adoption and engagement with WMAs, and what core functionalities do these apps offer?
- RQ2: How do WMAs influence users' behaviour towards sustainable and circular fashion practices?
- RQ3: What psychological and emotional benefits do users report from using WMAs?
- RQ4: What additional consumer benefits do WMAs provide?

- RQ5: How do current monetisation strategies of wardrobe management apps impact user accessibility and satisfaction?

To address these research questions, this study employed a comprehensive, multi-phase methodology. A thematic analysis of WMAs was conducted to assess user adoption trends and engagement levels, alongside identifying and categorising the core functionalities provided by these apps (RQ1). This thematic approach also explored how WMAs influence user behaviours, particularly in fostering sustainable and circular fashion practices, such as reducing garment consumption, increasing the use of existing wardrobe items, and encouraging reuse, resale, or donation (RQ2). The analysis further examined the psychological and emotional benefits reported by users, including reduced decision fatigue, enhanced self-confidence, and improved mental well-being (RQ3). Additional consumer benefits investigated included improved wardrobe management, financial savings, and support for organisation and decluttering (RQ4). Lastly, the study analysed challenges associated with monetisation strategies, such as subscription costs and their effects on user accessibility and satisfaction, to provide actionable insights for improving app usability and retention (RQ5). This integrated approach provides a holistic understanding of the role WMAs play in advancing sustainability, improving consumer well-being, and fostering a more mindful approach to fashion consumption.

2. Literature Review

2.1. Impact of Fashion Consumption on Well-Being

Fashion consumption is a double-edged sword when it comes to consumer well-being. It benefits individuals by enabling them to express creativity, assert social identity, and fulfil a sense of uniqueness [19–21]. However, the fashion industry often promotes unattainable body ideals, creating psychological strain, especially for women [22]. Exposure to unrealistic beauty standards can lead to body dissatisfaction and harmful comparisons [23], contributing to body anxiety, low self-esteem, and eating disorders [24]. These psychological pressures are compounded by fast fashion's emphasis on constant consumption, which fuels insecurity by linking self-worth to external appearance [25].

Furthermore, the rise of compulsive buying disorder (CBD) among fashion consumers is alarming. CBD is characterised by obsessive shopping and emotional relief through purchases, affecting millions globally [26]. The fast fashion industry, which thrives on frequent new trends and low-priced items, further encourages this unhealthy spending pattern, particularly among younger demographics [27]. The financial and emotional toll of CBD is severe, often leading to anxiety, financial distress, and chronic debt cycles. Studies indicate that 58% of individuals with CBD accumulate significant debt, while 42% struggle to meet their payment obligations. Compulsive buyers are also four times more likely to make only minimum payments on their credit cards, exacerbating financial instability and emotional distress [28,29]. Emotionally, CBD is linked to feelings of guilt, shame, and anxiety, as individuals often engage in shopping as a form of temporary relief, only to experience further distress when faced with financial consequences [30].

Initial sustainability research, and the focus of the fashion industry, is on how to encourage consumers to purchase 'green' or 'sustainable' fashion products [31,32]. However, increasingly, there is more research on consuming less, highlighting the benefits of reducing fashion consumption for both mental well-being and environmental impact [33,34]. Developing a more mindful and sustainable relationship with fashion involves not only buying less but also cultivating new decision-making habits, such as reflecting on garment use, delaying purchases, and evaluating needs before buying. Factors that have been shown to support this shift include increased wardrobe visibility, emotional attachment to and a deeper appreciation of existing items, and awareness of financial and environmental

costs [35,36]. While most studies focus on encouraging more sustainable purchases, such as eco-friendly clothing, rather than consumption reduction per se, insights from this literature remain valuable. For instance, Abrar et al. found that environmental apparel knowledge and green self-concept significantly shaped young consumers' intention to purchase green clothing [37]. These findings suggest that identity, awareness, and social belonging may also play a role in reducing overall clothing consumption when supported by appropriate tools. These identity-driven motivations are also reflected in the rise of minimalist and slow fashion movements, which encourage consumers to focus on buying less and making more thoughtful choices about their clothing. By prioritising quality over quantity, individuals can form stronger emotional connections with their garments, improving life satisfaction and happiness [38]. This reduced consumption also alleviates the psychological pressures of constant buying, helping individuals regain control over their fashion choices [11].

2.2. The Attitude-Behaviour Gap in Sustainable Fashion Consumption

The Theory of Planned Behaviour (TPB) is the most commonly used framework for understanding consumer behaviour in the context of sustainable fashion consumption [39]. According to TPB, consumer behaviour is influenced by three key factors: attitudes, subjective norms, and perceived behavioural control [40]. Positive attitudes toward sustainability, social pressures to act ethically, and a sense of control over one's ability to make sustainable choices are all expected to drive eco-conscious behaviour [41]. However, even when individuals hold positive attitudes toward sustainability, external pressures and psychological barriers, such as the convenience of fast fashion and the desire for immediate gratification, can prevent them from reducing their consumption [42]. Hedonistic tendencies, such as seeking pleasure from acquiring new items, often outweigh altruistic motivations, further complicating efforts to adopt more sustainable habits [29]. This discrepancy between consumers' intentions and their actual behaviours is often referred to as the "attitude-behaviour gap" [43,44]. While consumers may express a desire to engage in sustainable consumption, factors like price sensitivity and the appeal of fast fashion contribute to overconsumption, making it difficult for individuals to align their actions with their values.

Reducing fashion consumption requires more than awareness-raising alone; it also involves addressing the psychological drivers of overconsumption, including instant gratification, identity expression, and habitual shopping behaviours [45]. Behavioural interventions, such as digital wardrobe tools, can support change by simplifying daily choices, making garment use visible, and prompting users to rethink buying habits. Behavioural interventions have been shown to help bridge the attitude-behaviour gap, in related research, by reinforcing sustainable actions through convenience, repetition, and personalised feedback [46,47].

2.3. The Potential of Wardrobe Management Apps

Several studies focus on user adoption and engagement of WMAs. Bang and Su showed that consumer traits, such as socially responsible consumption behaviour and personal innovativeness in technology, influence attitudes towards virtual wardrobes [48]. Their study is limited to psychographic factors and does not examine how WMAs promote sustained behavioural change or reduce overconsumption. Similarly, Dumeljic et al. introduced the *Moody Closet* app, which uses mood-based recommendations for outfit selection [49]. By incorporating gamification, the app encourages user engagement. Still, these studies focus primarily on the novelty of emotion-driven interactions, and do not address the question of how the WMA can support sustainable fashion practices.

Other research focuses more on the technical and functional capabilities of WMAs. Limaksornkul et al. developed *Smart Closet*, an app offering statistical recommendations

based on past usage, weather conditions, and special occasions [50]. Khan et al. enhanced the technological capabilities of WMAs by integrating digital image processing to track clothing and suggest outfits [51]. While these approaches improve wardrobe efficiency, their work omits the potential for these systems to lead to long-term reductions in fashion consumption or encourage more sustainable behaviours.

Scaraboto et al. take a more sustainability-focused approach with their examination of the *Save Your Wardrobe* app, which aims to disrupt patterns of overconsumption by helping users manage their wardrobes more mindfully [52]. Their preliminary findings suggest that such apps can promote sustainable consumption, without exploring the long-term effects of WMAs on consumer habits or their role in reducing overconsumption.

Despite the growing interest in WMAs, there is a significant research gap in understanding their long-term impact on reducing garment consumption and promoting sustainable fashion behaviour. Additionally, the impact of WMAs on consumer well-being, particularly in alleviating the psychological stress associated with overconsumption and fostering a healthier relationship with fashion, has not been examined.

This paper aims to address these gaps by examining how WMAs can promote sustainable practices and improve mental well-being. By exploring user self-reported behaviours, app functionalities, and psychological effects, this research seeks to provide a more comprehensive understanding of how WMAs can contribute to sustainable fashion practices and enhance consumer well-being.

3. Methodology

3.1. App Selection Criteria

The identification of WMAs involved a systematic search conducted on the Apple App Store and Google Play Store. Initial searches occurred between 20 and 30 March 2023, followed by a second review on 13 September 2024 to account for changes in app availability, development status, and popularity trends. Although this 10-day search period may appear brief, it was focused and systematic, using defined keywords across multiple platforms (Apple App Store and Google Play) to generate a preliminary sample of applications. This was followed by iterative screening, evaluation of app content and reviews, and ongoing validation over the following months, ensuring that only actively used and functionally relevant apps were retained.

The keywords used in the research—“wardrobe”, “closet”, “outfit”, “wardrobe management”, “digital wardrobe”, “digital closet”, and “wardrobe organiser”—were selected based on four considerations: (1) terminology used in the literature; (2) terminology commonly used by existing wardrobe management apps; (3) user search terms identified in app store metadata and app descriptions; and (4) alignment with the functions and goals central to the study, such as garment tracking, outfit planning, and digital inventory management. This approach was intended to maximise coverage of relevant apps while minimising irrelevant returns from adjacent fashion or e-commerce categories. For each app, key data points were collected to facilitate analysis, including:

- App name and description
- Platform availability
- Pricing structure (e.g., download costs, in-app purchases)
- User ratings and download figures (only accessible via Google Play)
- Last update date and developer details

Following a careful screening process, 27 wardrobe management apps were identified, as illustrated in Figure 1. The selection was conducted by the first author based on the predefined inclusion and exclusion criteria and confirmed by the second author to ensure

alignment with the study's aims and methodological rigour. The inclusion criteria for app selection were:

- Explicit reference to “wardrobe/closet management/organiser” in the app title or description
- Core functionality enabling users to upload images of garments to create a digital wardrobe
- Availability of an English-language interface or English translation

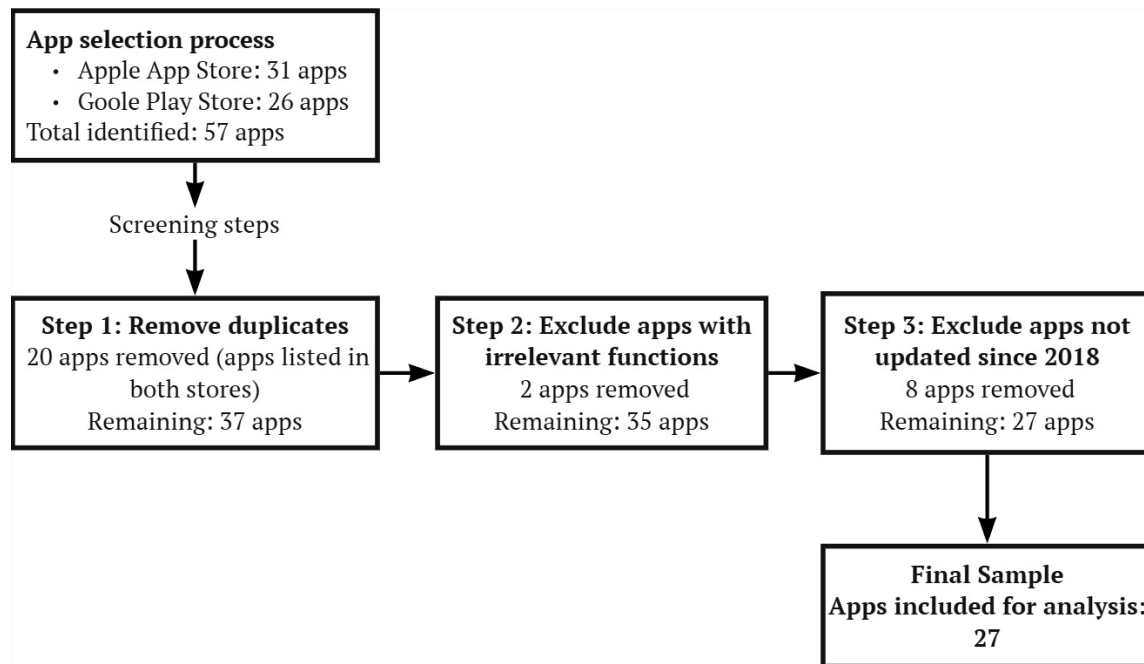


Figure 1. App Identification and Screening Process.

Apps were excluded if:

- Their primary focus was limited to outfit creation using preloaded images
- They had not been updated since 2018

3.2. App User Review Collection

To gain insights into user experiences and perceptions, user reviews of the selected wardrobe management apps were systematically collected from the Google Play Store and the Apple App Store. The review collection process occurred on 23 September 2024, using Azure Data Studio 1.51.0 with Python-based web scraping script built with the publicly available BeautifulSoup package (<https://www.crummy.com/software/BeautifulSoup/> (accessed on 20 September 2024)), which enabled automated extraction of user reviews from the Apple and Google Play stores. As Table 1 shows, the initial dataset comprised 8298 user reviews.

To ensure data quality and relevance, a rigorous cleaning process was applied. Reviews were excluded if they:

- Contained fewer than five words, which often lacked meaningful content [53]
- Were written in languages other than English
- Included duplicate entries
- Consisted of nonsensical or irrelevant text

After applying these exclusion criteria, 5953 reviews were retained for thematic analysis.

Table 1. Overview of user review data collected per app for both platforms and volume of cleaned data.

App Name	Number of Reviews	
	Google App Store	Apple App Store
Save your wardrobe	72	86
Whering	810	880
Acloset	1624	51
Indyx: Wardrobe & Outfit App	91	19
Smart Closet	1285	56
CAPSULE Wardrobe	1	3
Clozzie—Your Digital Closet	0	5
Pronti AI- Outfit Maker	206	18
Cladwell	123	64
Getwardrobe outfit planner	380	26
OpenWardrobe	192	9
Style DNA: Fashion AI Stylist	696	78
XZ(Closet)	85	2
Purple Outfit Planner	338	151
Closet Love—Virtual Closet	0	6
My Wardrobe—All your clothes	124	1
Mind Dress: Mindful Wardrobe	40	N/A
Stylicious	495	
Stylebook	N/A	243
Fits—Outfit Planner & Closet		7
My Closet and OOTD Lookbook		3
Lookscape		13
My Wardrobe—Outfit Maker		2
Wardrobe: Outfit ideas for men		8
CLOSET		5
Total	6562	1736

3.3. Data Analysis

Thematic analysis was employed to systematically analyse the user reviews and app descriptions, focusing on patterns related to WMAs usage, their core functionalities, and their impact on sustainable consumption and user well-being. Braun and Clarke's framework guided this process, ensuring a rigorous and transparent approach [54].

The cleaned dataset of 5953 user reviews and the descriptions of 27 selected apps were imported into NVivo, a qualitative data analysis tool. The initial coding phase involved line-by-line open coding to capture recurring topics, sentiments, and features across user feedback and app descriptions. A hybrid approach was used, combining inductive coding (to allow patterns to emerge from the data) with deductive coding (guided by pre-established themes related to behaviour change, sustainability, and digital engagement). This phase generated a broad set of primary and secondary codes, including aspects such

as behaviour and psychological change, positive feedback on the app and specific features, suggested functions, and negative feedback.

Following the initial coding, the dataset was reviewed iteratively to consolidate overlapping codes and clarify thematic boundaries. Codes were re-evaluated, and then grouped into broader themes:

1. Environmental and personal benefits of using WMAs
2. User perceptions of WMAs

The coded data underwent a validation process to enhance the rigour of the analysis and reduce researcher bias. The first author was responsible for coding and theme development, while the second author assessed the theme structure and codes and reviewed representative user reviews to ensure accuracy and minimise bias. Any discrepancies and ambiguities were resolved through discussion to ensure consensus on the final theme structure.

Figure 2 presents the distribution of reviews across each theme, showing the percentage of total analysed reviews ($n = 5953$), followed by the proportion of reviews addressing Theme 1 ($n = 1063$ themes from $n = 850$ individuals) and Theme 2 ($n = 5103$). It is important to note that reviews coded under Theme 2 were assigned to a single code, while reviews addressing Theme 1 were generally richer and more extensive, with some engaging with multiple codes in sufficient depth to warrant dual categorisation. Consequently, the percentage total for ‘overall codes and sub-themes’ exceeds 100%.

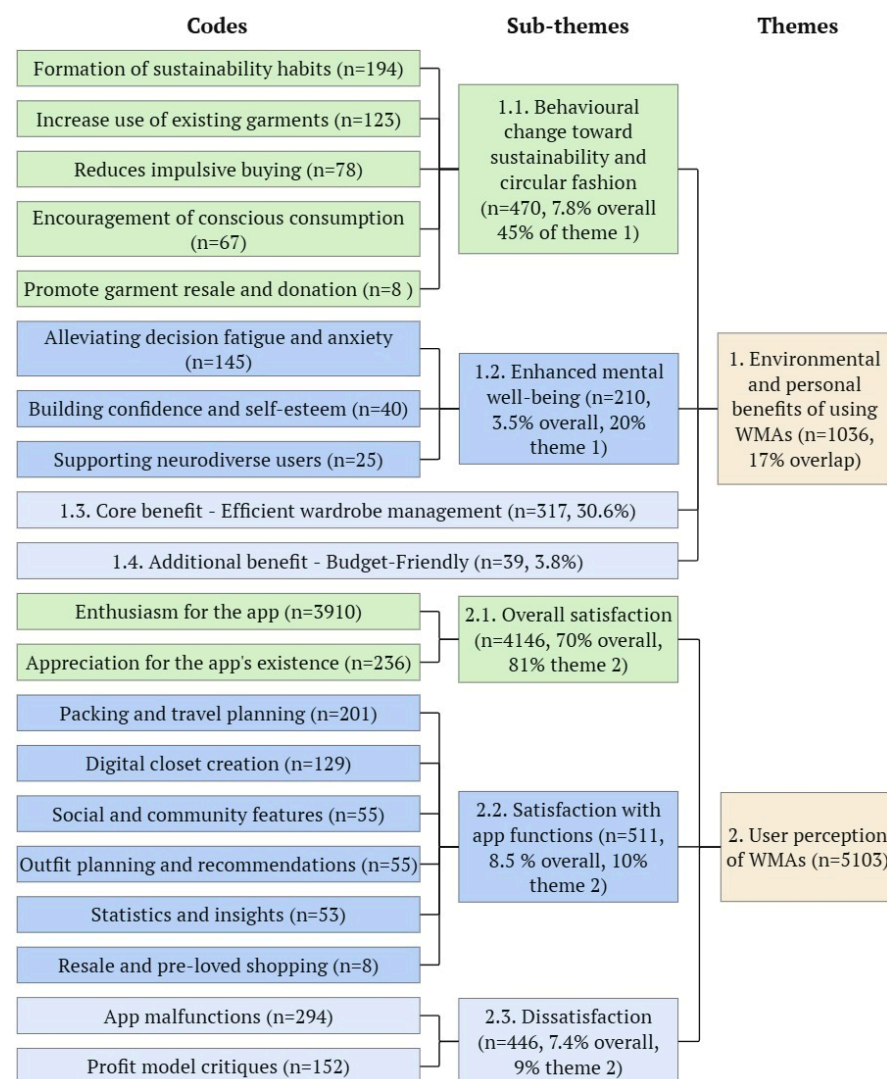


Figure 2. Coding tree for thematic analysis of user perceptions and benefits of WMAs.

4. Results and Discussion

4.1. Overview of Wardrobe Management Apps

4.1.1. User Adoption and Engagement

The download statistics for 20 apps on Google Play showed that 8 of them (40%) surpassed 500,000 downloads, establishing this as the most prevalent range. Furthermore, 5 apps (25%) exceeded 1 million downloads, reflecting strong consumer interest, while the others saw moderate downloads ranging from 1000 to 100,000.

The download figures also demonstrated notable changes from 2023 to 2024. Overall, downloads surged by 236%, with different apps growing at different rates in the 18 months between censuses. Three apps maintained their download numbers at over 1 million, suggesting market saturation, consistent consumer interest, or not having reached the next download threshold, while 10 apps saw remarkable growth, adding between 400,000 and 950,000 downloads. These trends suggest a rising popularity of wardrobe management apps, influenced by feature enhancements and effective marketing strategies.

In terms of user ratings, Apple App Store apps averaged a rating of 4.2, with 8 apps achieving scores above 4.5. Google Play apps, despite higher user engagement numbers, averaged a lower rating of 3.7. This discrepancy may reflect differences in user expectations, app versions, or the diversity of Android devices compared to the more standardised iOS environment. While this study did not examine review content specifically related to app ratings or the reasons behind them, the observed variation highlights the potential influence of platform-specific factors on user satisfaction. Although outside the scope of this research, future studies could explore how differences in operating systems, user demographics, or app performance contribute to their ratings and these discrepancies.

User reviews further illustrated the popularity of WMAs, with 3910 mentions of terms like “game changer”, “obsessed”, and “love it” (Coded: Enthusiasm for the app in Figure 2). Positive sentiments included “*Absolutely love this app! It has completely changed how I organise my wardrobe*” (R38) and “*A must-have for anyone who loves fashion—so easy to use!*” (R74). Such enthusiastic feedback illustrates user adoption and satisfaction, highlighting the potential of WMAs to meet functional and emotional user needs. Additionally, 236 user reviews explicitly expressed gratitude for the existence of WMAs, describing them as “dream apps” that exceeded expectations. One user noted, “*I’ve been waiting for something like this for years. It helps me plan outfits and keeps everything so organised*” (R179). These sentiments align with Bhattacharjee’s concept of perceived value, where tools that fulfil specific user needs tend to result in higher satisfaction and perceived utility [55].

4.1.2. Core Functionalities of WMAs

WMAs offer a range of features that help users organise and manage their clothing, reduce fashion waste, and adopt more sustainable consumption practices. The analysis identified 6 core functionalities, shown in Table 2 common across the 27 apps in this research, each catering to specific aspects of wardrobe management and user needs. The user insight Codes are shown in Figure 2, Sub-theme 2.2: Satisfaction with app functions ($n = 511$, 8.5% overall, 10% theme 2).

The analysis revealed that users appreciated features promoting organisation, creativity, and sustainability. Tools like digital closet creation and outfit planning were the most universally provided, aligning with research on digital tools, which suggests that reducing decision fatigue and enhancing daily efficiency is desirable [56]. These features streamlined user routines, simplifying the process of selecting and planning outfits and providing users with a greater sense of control over their wardrobe choices. Meanwhile, features like statistics and resale options empowered users to adopt more eco-conscious behaviours, reflecting the principles of slow fashion and mindful consumption [57]. For

instance, cost-per-wear metrics encouraged users to maximise the utility of their garments, while resale functionalities supported circular fashion practices by enabling garment reuse and extending product lifecycles [58].

Table 2. Core functionalities of wardrobe management apps.

Feature	Description	Prevalence	User Mentions	Typical User Insights
Digital Closet Creation and Wardrobe Organisation	Users can digitise their wardrobes by photographing items and categorising them by type, season, or occasion for easy organisation.	Present in all apps ($n = 27$)	139	<i>“Creating a digital closet was super easy, and now I can plan my outfits in advance without any hassle” (R610).</i>
Outfit Planning and Recommendations	Enables users to schedule outfits, receive recommendations based on weather, events, or wardrobe, and integrates with calendars.	Present in all apps ($n = 27$)	55	<i>“It was a great experience having visibility of my wardrobe and planning my outfits ahead. The AI suggestions were creative and easy to use” (R5263).</i>
Statistics and Insights	Provides metrics such as cost-per-wear and item usage statistics to promote mindful consumption and sustainability practices.	48% of apps ($n = 13$)	53	<i>“Tracking cost-per-wear has completely changed my perspective on shopping. I now realise how much value I can get from my wardrobe” (R1034).</i>
Packing and Travel Planning	Assists users in efficiently packing for trips by suggesting items based on planned outfits and weather.	48% of apps ($n = 13$)	201	<i>“The packing feature ensures I never over-pack or forget anything important. It’s been a lifesaver for my work trips” (R5197).</i>
Social and Community Features	Facilitates sharing of wardrobes, outfit ideas, and inspiration within a community or among friends.	30% of apps ($n = 8$)	55	<i>“Love being able to share my outfits with friends and get their feedback. It’s made dressing up more fun” (R1552).</i>
Resale and Pre-loved Shopping	Includes features for buying/selling pre-loved clothing and connecting with ethical fashion brands to encourage circular fashion.	19% of apps ($n = 5$)	8	<i>“This app has encouraged me to opt for second-hand clothing over new purchases. It’s made me rethink how I shop” (R5561).</i>

4.1.3. Efficient Wardrobe Management

The most frequently reported benefit of using WMAs was improved organisation and ease of wardrobe management ($n = 317$ in sub-theme 1.3 of Figure 2). Users consistently highlighted how WMAs streamlined their routines by digitising and categorising clothing items, making it easier to visualise, select, and plan outfits, exemplified by:

“Absolutely love how this app keeps my wardrobe perfectly organised. It makes creating outfits and keeping track of what I have incredibly simple” (R3428)

“This app has revolutionised my closet! It’s so easy to see everything I own, which makes outfit planning effortless. I’m more organised than ever” (R2772)

By digitising and categorising clothing, users were able to visualise their entire wardrobe easily, making the process of selecting outfits simpler.

Research suggests that effective organisations can save time and increase efficiency [59]. The apps streamline outfit selection by providing users with a visual overview of their wardrobe, especially during busy mornings. Users highlight how the apps enable them to save time by making outfit choices quicker and more convenient:

“... It allowed me to organise my entire closet quickly, making it so much easier to put outfits together without wasting time” (R3321)

Studies on decluttering and digital organisation tools have shown similar benefits, fostering greater efficiency in everyday routines [60]. Several users ($n = 59$) also noted the efficiency of the apps in helping them plan outfits for specific occasions, such as holidays or events. One user mentioned:

“This app has made planning for holidays and events so efficient—everything is organised and ready, which saves me tons of time” (R1948)

Planning and storing outfits for different occasions was a major advantage, saving users time and simplifying outfit selection. This aspect is consistent with findings by Orzechowski, who found that pre-planning and organisation tools enhance preparedness and reduce time spent on routine decisions [61].

4.2. Behavioural Change Toward Sustainability and Circular Fashion

WMAs have demonstrated significant potential to influence consumer behaviour, promoting more sustainable fashion practices by encouraging mindful consumption and reducing overconsumption. As Figure 2 shows, through thematic analysis of user reviews (Sub-theme 1.1: Behavioural change toward sustainability and circular fashion, $n = 470$, 7.8% overall, 45% of theme 1), key behavioural changes were identified, aligning with established sustainability frameworks, such as slow fashion principles [57] and circular fashion practices [58].

4.2.1. Formation of Sustainability Habits

The adoption of sustainable habits, such as tracking clothing usage and prioritising pre-owned fashion, was noted by 194 users. Features like cost-per-wear metrics and second-hand marketplace integrations motivated users to make intentional fashion choices. As users indicated:

“It encourages sustainable practices as it uses metrics to measure your cost per wear, and you know what’s in your closet, so you won’t accidentally purchase duplicates” (R2868)

“... I also love that Whering promotes other platforms for sustainable and second-hand shopping, so there’s a great focus on helping you build an actually sustainable wardrobe” (R4796)

These testimonials underscore how the app facilitated sustainable habits by helping users organise, track, and creatively utilise their clothing, encouraging mindful consumption. This sentiment is supported by findings that convenience and ease of access to information can significantly impact consumers’ commitment to sustainable practices [62]. By simplifying access to wardrobe data and encouraging outfit planning, the app supported users in making informed and intentional purchasing decisions, focusing on quality over quantity and minimising their environmental footprint. This encouragement to form sustainable habits also aligns with studies highlighting the importance of behavioural nudges in promoting environmentally friendly actions [63].

4.2.2. Increased Use of Existing Garments

The largest specific behavioural shift reported by users (shown in Figure 1) was the increased utilisation of existing wardrobe items ($n = 123$). Many reviews emphasised how fashion recommendations provided by the app enabled users to create new outfits from garments they already owned. As users mentioned:

“I absolutely love this app. It reminds me to wear forgotten items and suggests fun combinations I’d never think of on my own.” (R4657)

“This app has completely transformed how I use my wardrobe; I can easily put together outfits from clothes I had forgotten about” (R1086)

This finding underscores the apps' role in fostering a "shop your closet" mentality, which encourages creativity and frugality [64]. By maximising the use of existing garments, users reduced their reliance on new purchases, contributing to a slower fashion cycle and minimising waste. This behavioural shift not only supports more sustainable consumption patterns but also aligns with the broader goal of reducing impulsive buying, as discussed in Section 4.3.3.

4.2.3. Reduces Impulsive Buying

WMAs significantly curbed impulsive buying behaviours among some users ($n = 78$) by providing a clear overview of existing wardrobe items. One user explained:

"I have a problem with compulsive buying. Now, before buying anything, I just take a look at all the clothes I already have and decide wisely. This app could be the first step towards a minimalistic lifestyle" (R3171)

Users also highlighted how the app helped them rediscover and utilise existing garments rather than making new purchases, providing the same sense of satisfaction as shopping but without financial expenditure. This feature played a key role in reducing impulsive buying by offering a structured way to engage with their current wardrobe, reinforcing more intentional consumption habits. For example:

"I feel like I'm going window shopping in my own wardrobe... really helps you appreciate what you have and has reduced my impulse buying" (R4692)

These insights align with existing literature on digital wardrobe tools and consumer decision-making. Armstrong et al. suggest that the ability to visualise one's clothing inventory can reduce consumerism by providing a clearer overview of owned garments, thereby discouraging unnecessary purchases [65]. This reduction in impulsive buying due to increased awareness is consistent with studies that indicate consumers often shop impulsively when they lack clarity about their current wardrobe [66].

4.2.4. Encouragement of Conscious Consumption

WMAs also heightened users' awareness of their consumption habits by digitising their wardrobes, enabling them to track garment usage and reduce unnecessary purchases ($n = 67$). For example:

"This app has helped me in so many ways, from clearing out my closet to being more mindful and intentional about what I buy. It has helped me reduce my spending and environmental impact while at the same time improving my style" (R4299)

The app's ability to enhance users' awareness of their wardrobe aligns with broader literature that identifies awareness as a key driver of sustainable consumption [67]. By digitising their clothing inventory, users gain insights into how often they wear each item, which ultimately influences their purchasing behaviour. This increased awareness allows users to prioritise what they already own rather than continuously acquiring new items. As another user put it:

"A really thoughtful app to help you become more aware of the clothes you have in your wardrobe. Wardrobe upload can feel slow, but it can be done in batches. It's totally worth it, and you can build outfits. I love the content and the fact that there are services to help you lengthen the life of your clothes." (R4029)

This heightened awareness influenced users' shopping habits and encouraged them to be more intentional about keeping and discarding items, thus promoting decluttering and a more organised wardrobe. According to Joung, "wardrobe visibility" directly impacts purchase decisions as consumers become more aware of redundant or underutilised

items [68]. This awareness is critical in reducing overconsumption and embracing more mindful shopping habits [69].

4.2.5. Promote Garment Resale and Donation

A few users ($n = 8$) specifically highlighted the app's effectiveness in encouraging garment resale and donation. Users reported identifying underutilised items for donation or resale, contributing to the extended lifecycle of their clothing:

"It's super helpful to track what you wear and what you should donate, and it's encouraged me to donate things that I don't like anymore, so I only have nice things in my closet. I would really recommend it." (R3684)

These quotes reflect how the app has actively encouraged users to declutter and donate items, ensuring that garments continue to be used rather than ending up as waste. The app's features also enabled users to quickly identify items that were no longer serving them:

"It's an essential. I get so much use out of all of my wardrobe and quickly learn which items need to be sold or sent to a charity shop if I don't wear them." (R4036)

The concept of garment reuse is vital to reducing the negative environmental impact of fast fashion, as it promotes the extended use of clothing and reduces textile waste [58]. By encouraging users to donate or repurpose items, the app directly supports these goals, contributing to a more sustainable fashion lifecycle.

4.3. Enhanced Mental Well-Being

WMAs are not only tools for practical wardrobe organisation but also vehicles for enhancing psychological well-being and emotional satisfaction. As Figure 2 shows (Sub-theme 1.2. Enhanced mental well-being, $n = 210$, 3.5% overall, 20% theme 1), users' review data revealed several contributing factors to improved mental health, including reduced decision fatigue, greater control over daily choices, improved self-confidence, and feelings of calm from visual order. Some users also reported that these tools helped them manage symptoms associated with ADHD and anxiety, highlighting their relevance for neurodiverse users. These impacts align with broader research on the psychological benefits of structured tools and decision-making aids [56].

4.3.1. Alleviating Decision Fatigue and Anxiety

A primary psychological benefit of WMAs was their ability to reduce decision fatigue, a common experience linked to the overwhelming number of daily choices. Tools like AI-driven outfit recommendations and calendar-based planning were highlighted by 145 users as timesaving and stress-reducing features. As users commented:

"This is so brilliant. I feel like I'll finally get to wear all my gorgeous outfits now instead of just throwing on the old reliable due to decision fatigue" (R2412)

"This app is extremely helpful. It helps take out the stress of wondering what I'm going to wear each day." (R3404)

Some users specifically noted that the app helped alleviate anxiety, for example:

"This app has helped my anxiety and enabled me to leave the house more" (R922)

"I also happen to have major anxieties. This app helps a lot. I can log all my clothing and what I wear when I go out or even when I'm home. It at least eases my anxiety about that." (R5168)

These findings align with research by [56], who found that reducing the number of choices in routine tasks can alleviate stress and improve well-being. Decision fatigue, where

the quality of decisions deteriorates after making numerous choices, is a well-established phenomenon in psychology [70]. By providing structured, easy-to-use features, these apps help alleviate the overwhelming effects of decision fatigue. Research also indicates that simplifying decision-making in daily tasks can reduce anxiety levels [71]. Users consistently reported that the app made their lives less stressful by removing the cognitive burden of outfit selection, reinforcing Schwartz's findings that fewer choices can lead to greater satisfaction and reduced anxiety [71]. The alignment between user feedback and the literature underscores the potential of digital wardrobe tools to enhance mental health by streamlining decision-making processes.

4.3.2. Building Confidence and Self-Esteem

WMAs were also reported to enhance self-confidence by empowering users to feel more prepared and polished in their daily and special-event outfits. In total, 198 users linked planning and visualising outfits to improved satisfaction with personal style and a sense of accomplishment, illustrated by comments like:

"Getting compliments. Actually, hearing people at work say how well I'm put together, that I have flair, and that they love my outfits. Considering I've never been a fashion maven and was considered a nerd back in the days when needs weren't cool, this has been a total confidence boost..." (R5643)

"It took a few days to go through the whole wardrobe, but I feel confident now that I am in control." (R4977)

These insights resonate with research suggesting that increased organisation and preparedness positively impact self-esteem [72]. Additionally, according to Bandura, self-efficacy, or one's belief in their ability to succeed, plays a critical role in confidence [73]. By giving users a clear sense of control over their wardrobe and enabling them to create outfits that made them feel good, the apps contributed positively to their sense of self-efficacy. Furthermore, the ability to receive compliments and recognition from others also played a significant role in enhancing users' confidence. Literature on social validation highlights the importance of positive feedback in reinforcing self-esteem [74]. Users frequently mentioned receiving compliments on their appearance, which further motivated them to maintain an organised wardrobe and continue experimenting with their style. The connection between organisation, creativity, and positive feedback illustrates how wardrobe apps can influence confidence.

4.3.3. Supporting Neurodiverse Users

WMAs offer unique benefits to neurodiverse users, such as those with ADHD or executive functioning challenges. In total, 45 users reported that the apps' structured and visual approach to wardrobe management helped mitigate feelings of overwhelm. As users shared:

"I have ADHD and really struggle with object permanence; this is the best app I have found to upload all of my clothes and create outfits to remind me what I have and what goes with what" (R4365)

"My ADHD makes organisation super hard, and this has helped me keep everything in order... mornings are so much less stressful" (R4533)

Barkley emphasises that individuals with ADHD often struggle with executive functions, such as planning, organising, and remembering [75]. The use of external aids, like wardrobe management apps, can mitigate these challenges by providing a structured and visual approach to organising clothing.

Additionally, research by Dawson and Guare suggests that visual supports and digital tools can enhance executive functioning in individuals with ADHD by making abstract tasks more tangible [76]. This aligns with user feedback, which emphasises the value of having a visual representation of their wardrobe. The positive impact on reducing stress and improving morning routines demonstrates how the structured interventions provided by these apps can facilitate better executive functioning. Verplanken and Roy also argue that habit-forming tools can promote sustained behavioural change, which was evident in users' descriptions of their improved daily routines [22].

4.4. Additional Benefit to Consumers: Financial Savings

WMAs offer numerous ancillary benefits that extend beyond their primary functionalities, significantly enhancing user experiences and daily life. As Figure 2 shows, these benefits include improved wardrobe efficiency (sub-theme 1.3), increased sustainability (sub-theme 1.1), improved well-being (sub-theme 1.2), and financial savings (sub-theme 1.4), reflecting the apps' multifaceted impact on consumer well-being and lifestyle.

A notable benefit was the financial savings achieved through increased wardrobe visibility and reduced unnecessary purchases ($n = 39$). For example:

"Saved money by seeing what I already have in my wardrobe and recreating outfits I love. 10/10" (R1369)

"I've saved so much money just by using what's already in my wardrobe. Recreating outfits with what I own has been a game changer!" (R1821)

Young consumers often face challenges managing debt, particularly due to impulsive spending and overconsumption [77,78]. Wardrobe management apps help address this issue by encouraging users to make better use of their existing clothing, which reduces the need for unnecessary purchases. This aligns with research on financial well-being, emphasising the importance of reducing discretionary spending to avoid debt [35]. By promoting the use of items already owned, these apps can help young consumers avoid excessive spending and better manage their finances.

The apps also encouraged users to evaluate the cost-per-wear of their clothing, which increased their awareness of spending habits. One user shared:

"Tracking the cost-per-wear has completely changed my perspective. I'm realising how much value I can get from what I already have, and it's definitely helped me save money" (R3199)

This aligns with economic decision-making research, which indicates that when consumers perceive more value from their existing items, they are less likely to make impulsive purchases [79]. These insights illustrate how WMAs can foster better financial habits by promoting thoughtful, informed purchasing decisions. Features such as cost-per-wear tracking, wardrobe visualisation, and outfit planning are particularly effective in this regard, as they help users assess the value of their existing clothing, avoid duplicate purchases, and make more intentional shopping decisions.

4.5. Monetisation and Pricing Models

Despite the numerous benefits offered by WMAs, such as reducing overconsumption of fashion, enhancing user well-being, and supporting more mindful engagement with existing clothing, monetisation strategies remain a critical challenge. While these apps have the potential to help users adopt more sustainable habits, their pricing models may limit accessibility and long-term use. An observable trend among WMAs is the shift toward subscription-based pricing. In 2023, 19 apps (70%) were entirely free to use, but by 2024, 74% ($n = 14$) had introduced subscription plans, with costs ranging from £0.89 to £114.99

per year or as one-time in-app purchases, depending on the pricing model. Many apps adopted tiered pricing structures to cater to diverse user needs, offering basic features such as digital wardrobe creation, outfit logging, and limited outfit recommendations for free, while reserving premium functionalities—such as AI-driven styling suggestions, advanced analytics (e.g., cost-per-wear tracking), unlimited wardrobe items, and ad-free experiences—for paying subscribers. This approach balances affordability for casual users with advanced options for more engaged consumers. However, the reliance on subscription models raises concerns about inclusivity, particularly for cost-sensitive or in-debt users who may be unable to justify the expense.

User feedback reflects significant dissatisfaction with the monetisation strategies employed by some apps. As Figure 2 shows, 34% ($n = 152$) of the 446 reviews critiquing these models were recurring complaints about high subscription costs, hidden paywalls, and limited access to essential features without payment. One user expressed frustration:

“I invested so much time into using this app and found it appealing, but suddenly everything is behind a paywall. The new subscription-based model costs too much and feels like a bait-and-switch tactic” (R5332)

This sentiment underscores the importance of transparent communication regarding pricing changes to maintain trust and loyalty.

The presence of advertisements within some free versions of WMAs also elicited negative reactions. Users reported that intrusive ads disrupted their experience, with one reviewer stating:

“The subscription fee is far too high, and the relentless, unskippable ads make the free version nearly unusable” (R4750)

User feedback underscores the challenge developers face in balancing monetisation with user satisfaction. To navigate the complexities of subscription-based pricing in WMAs, developers could explore more flexible and transparent pricing strategies. A compelling example comes from the music streaming industry, where platforms such as Spotify have successfully implemented tiered pricing models to appeal to a broad user base. Spotify offers a free, ad-supported tier alongside premium subscription options that provide benefits such as offline listening, higher audio quality, and an ad-free experience. This approach has expanded market accessibility, allowing users to select a plan that aligns with their needs and financial capacity. The combination of flexibility and transparency has been crucial in enhancing user acquisition and retention, contributing to Spotify’s sustained growth in a competitive sector.

A similar model could be beneficial for WMAs, enabling them to provide a free version with core functionalities, such as basic wardrobe cataloguing and limited outfit recommendations, while reserving advanced features like AI-powered styling, detailed analytics, and personalised fashion insights for premium subscribers. This tiered approach could accommodate diverse user preferences, increasing engagement while fostering trust through clear and inclusive pricing structures. Moreover, by reducing reliance on rigid subscription models, developers can lower resistance from cost-conscious users, encouraging wider adoption of premium features over time.

In addition to tiered pricing, alternative monetisation strategies could further improve accessibility and retention. Freemium models, where fundamental features remain free and advanced functionalities are unlocked for a modest fee, can help attract and sustain a larger user base. Providing ad-free experiences at lower-cost tiers, offering promotional trials for premium plans, or integrating gamification and reward-based incentives, where users unlock premium features through consistent engagement, may further enhance user satisfaction while mitigating financial barriers.

While monetisation remains essential for the long-term viability of WMAs, ensuring that pricing structures align with principles of inclusivity and transparency is equally important. Adopting more user-centric models could not only alleviate concerns over affordability but also maximise the impact of these apps in promoting sustainable fashion consumption. Future research could explore innovative business models that strike an optimal balance between financial sustainability and widespread user adoption, ultimately fostering greater engagement with sustainable wardrobe management practices.

5. Conclusions

This study investigated how WMAs contribute to sustainable fashion practices and consumer well-being. Guided by five research questions, the findings highlight WMAs' multifaceted role in addressing overconsumption and promoting sustainable behaviours in the fashion industry.

For RQ1, "What is the current state of user adoption and engagement with wardrobe management apps, and what core functionalities do these apps offer?", our analysis of 27 WMAs revealed strong user engagement, with 25% exceeding 1 million downloads and a further 40% having 500,000–999,999 downloads. The apps offer six core functionalities, with digital closet creation and outfit planning being universally present. User ratings averaged 4.2 and 3.7 on the Apple App Store and Google Play, respectively, indicating generally positive user engagement. These apps demonstrate significant growth, with download figures surging by 236% from March 2023 to September 2024.

For RQ2, "How do wardrobe management apps influence users' behaviour towards sustainable and circular fashion practices?", our findings indicate that WMAs can significantly influence sustainable behaviour through features that promote mindful consumption. Users voluntarily reported forming sustainable habits ($n = 194$), increasing use of existing garments ($n = 123$), and reducing impulsive buying ($n = 78$) in their app reviews. Users frequently mentioned how the apps helped them track and evaluate their wardrobes, enabling them to avoid unnecessary purchases and foster a "shop your closet" mentality. Cost-per-wear metrics and second-hand marketplace integrations particularly motivated users to make intentional fashion choices. While users may have positive attitudes towards sustainability and perceive social norms supporting sustainable practices, the apps provide the necessary behavioural control to translate these intentions into action. In addition, the very presence of digital wardrobe tools may contribute to shaping and reinforcing these social norms, by signaling that sustainable wardrobe management is both achievable and increasingly mainstream. For some users, seeing these apps promoted on social media or integrated with second-hand marketplaces further validates sustainable choices as part of a broader cultural shift.

For RQ3, "What psychological and emotional benefits do users experience from using wardrobe management apps, particularly regarding mental well-being, decision-making, and confidence?", the study revealed significant psychological benefits, with 145 users reporting reduced decision fatigue and anxiety through AI-driven outfit recommendations and calendar-based planning. Additionally, 198 users reported enhanced self-confidence through better wardrobe management, while 45 neurodiverse users highlighted how the apps' structured approach helped mitigate organisational challenges, particularly for those with ADHD.

For RQ4, "What practical benefits do wardrobe management apps provide to consumers in terms of wardrobe efficiency and financial management?", the research identified substantial practical benefits, with 317 users reporting improved wardrobe organisation and efficiency. Financial benefits were particularly noteworthy, with 39 users explicitly mentioning monetary savings through reduced unnecessary purchases and better wardrobe

utilisation. Users consistently reported that the apps streamlined their daily routines and enhanced their ability to track and manage their clothing investments effectively.

For RQ5, “How do current monetisation strategies of wardrobe management apps impact user accessibility and satisfaction?”, despite the apps’ benefits, monetisation strategies present significant challenges to widespread adoption. By 2024, 74% of apps had introduced subscription plans or in-app purchases. While prices ranged widely from £0.79 to £169.99, the median price was £5.99 and the most frequently occurring price (mode) was £3.79, indicating that most offerings were in a lower price range. However, the mean price (£26.54) and maximum price show some more expensive ‘premium’ options. There was no correlation between price charged and consumer satisfaction ratings. Overall, 34% of all 466 negative user reviews criticised high subscription costs, hidden paywalls, and limited access to essential features.

These findings demonstrate that while WMAs offer significant potential for promoting sustainable fashion practices and enhancing user well-being, their impact could be further maximised through improved pricing strategies and accessibility. Future research could explore how these apps might be better integrated into broader sustainable fashion initiatives and how their benefits could be made more visible and accessible to a wider range of users.

6. Limitations and Recommendations

6.1. Limitations of the Study

While this study provides valuable insights into the benefits of WMAs, several limitations must be acknowledged. First, the data collection relied heavily on user reviews from app stores, which introduces potential bias due to the self-selecting nature of these contributors. These reviews tend to represent individuals who are either highly satisfied or highly dissatisfied, potentially skewing the results toward more extreme perspectives. As such, the findings may not fully represent the experiences of the broader user base, particularly those who are moderately engaged or indifferent. Nonetheless, this method also offers a unique strength: because app reviews are unsolicited and written voluntarily, they often reflect authentic motivations and spontaneous reflections. In the context of sustainability research, where social desirability bias can influence survey responses, this can provide particularly valuable insights into the views of users who are genuinely interested.

Additionally, the focus on English-language reviews restricts the generalizability of the findings to non-English-speaking populations, potentially excluding diverse cultural insights. Lastly, the study does not account for variations of in-app features or user experiences across different demographic groups, such as age, gender, or socioeconomic status, which could influence the perceived utility and impact of WMAs.

6.2. Recommendations for Future Work

Future research should aim to overcome these limitations by incorporating diverse data sources, such as surveys, interviews, or longitudinal studies, to capture a more comprehensive understanding of user experiences and behaviours. Documenting clothing purchases and spending behaviour before and during the use of WMAs could also provide valuable quantitative insights into the apps’ impact on consumption patterns, both in terms of volume and economic spending. Exploring cultural variations and demographic factors in the adoption and effectiveness of WMAs would provide richer insights into their global applicability.

Moreover, the investigation into integrating WMAs with other sustainability initiatives, such as second-hand marketplaces or repair services, could enhance their impact on reducing fashion waste. Research into gamification and personalization features could also shed light on strategies to boost user engagement and promote lasting behavioural changes.

By addressing these areas, future studies can contribute to a deeper understanding of how technology-driven solutions can support sustainable fashion practices and foster broader consumer well-being.

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