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Development of a Sustainable Fashion Mobile Application Prototype Using Rule-Based Filtering Approach

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Abstract*— The rapid growth of the fast fashion industry has significantly influenced consumer behavior, particularly among college students. The ease of online shopping, affordable prices, and constantly changing fashion trends encourage students to buy clothing more frequently, often based on impulse rather than actual need. This consumption pattern contributes to the increasing amount of textile waste, as many clothing items are used only for a short time before being stored, abandoned, or discarded. Therefore, a digital solution is needed to help users manage their clothing more responsibly and support sustainable fashion practices. This study aims to design and develop a mobile application prototype called ReHue. ReHue is designed as a sustainable fashion platform that combines smart wardrobe management, personalized clothing recommendations, and an integrated donation system. This research uses a quantitative and applied approach, focusing on UI/UX design using Figma and mobile prototyping using React Native. The system is developed based on literature related to circular economy, textile waste management, rule-based filtering algorithms, and sustainable digital business models. The proposed system applies a rule-based filtering method to provide personalized clothing recommendations based on real-time weather conditions and the user's color profile. In addition, ReHue uses a threshold-based tracking mechanism that detects clothing items that have not been worn for more than 210 days. When this threshold is reached, the system sends a notification encouraging users to donate the item. The donation feature is supported by gamification and monetary rewards to increase user motivation. Logic scenario testing shows that ReHue can execute recommendation rules and trigger donation alerts as intended. Overall, ReHue has the potential to reduce textile waste and transform impulsive fashion consumption into ecological action.

***Keywords*— Sustainable fashion; Smart wardrobe; Rule-based filtering; Mobile application; Textile waste**

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I. INTRODUCTION

The development of contemporary clothing trends is increasingly shaped by the fast-fashion phenomenon, which has transformed the way people purchase, use, and dispose of clothing. Fast fashion refers to the rapid production of inexpensive garments that follow the latest trends and are distributed quickly to consumers through both offline and online channels. This phenomenon has significantly influenced consumer behavior by encouraging people to buy clothes more frequently, often not because of functional needs, but because of changing trends, social pressure, and the desire to maintain a fashionable appearance [1].

The availability of e-commerce platforms has further intensified this behavior, as consumers can now access various fashion products easily, compare prices instantly, and complete transactions within minutes. This convenience accelerates the clothing purchasing cycle and increases impulsive buying tendencies, especially among students who are highly exposed to digital promotions, social media trends, discounts, and influencer-driven fashion content [2].

This excessive pattern of clothing consumption creates several serious consequences. At the individual level, frequent clothing purchases may affect students' financial behavior, particularly when they prioritize short-term satisfaction over financial planning. At the social level, fast fashion normalizes overconsumption and encourages the perception that clothes are disposable items with a short usage period. At the ecological level, the impact is even more concerning because the short lifespan of clothing directly contributes to the increasing volume of textile waste [3]. Many garments are discarded after only a few uses, either because they are no longer considered trendy, are of low quality, or are replaced by newer products. As a result, massive consumption of fast fashion has become one of the major contributors to textile waste accumulation, which pollutes the environment and places additional pressure on waste management systems [4].

In Indonesia, this problem is becoming more complex due to the high circulation of imported used clothing, including

illegal imports that continue to enter domestic markets. Although second-hand clothing can support reuse practices, uncontrolled illegal imports may increase the amount of textile waste when the products are already damaged, unsellable, or no longer usable. This condition adds to the burden of domestic textile waste management, especially when discarded clothing is not properly sorted, recycled, or redistributed [5]. Previous literature shows that used clothing waste in landfills has reached a critical condition, indicating the urgent need for more systematic intervention [6]. Textile waste made from cotton, polyester, nylon, and other synthetic materials may take a long time to decompose. Some synthetic fibers can release microplastics and harmful substances into soil and water, creating long-term ecological risks if they are not managed through appropriate circular mechanisms [7].

Therefore, addressing the textile waste crisis requires more than conventional social campaigns that merely encourage people to reduce consumption. While awareness campaigns remain important, they are often insufficient if not supported by practical tools that help users change their behavior. In this context, digital technology can play a strategic role by integrating sustainability principles into everyday activities. The development of digital sustainable business models allows ecological values to be embedded into platform design, user interaction, and service systems [8]. Intelligent digital platforms within a circular economy ecosystem can help minimize textile waste by facilitating clothing reuse, recycling, resale, and donation in a more organized manner [9]. Through digital platforms, users can monitor their clothing ownership, evaluate unused items, and connect with donation channels more easily.

Based on this urgency, this research proposes the design of a mobile application prototype called ReHue. ReHue is not only designed as a smart wardrobe management system, but also as an integrated sustainable fashion platform that encourages users to extend the lifespan of their clothing. The application provides features that allow users to digitally organize their wardrobe, identify rarely used items, and donate suitable clothing through a structured donation system. By combining wardrobe tracking and donation features, ReHue aims to transform consumptive fashion behavior into ecological action. This research focuses on designing an intuitive and user-centered UI/UX prototype so that students can easily understand, access, and use the application. Through this design, ReHue is expected to support sustainable fashion practices, reduce textile waste, and encourage environmentally responsible behavior among young consumers.

II. THE MATERIALS AND METHOD

The development of the ReHue mobile application prototype focused on two main pillars: designing an intuitive interface and implementing intelligent logic to manage clothing inventory. The interface was designed to be simple, clear, and accessible for college students who need a practical tool to organize their wardrobe. Through features such as digital wardrobe storage, outfit categorization, weather-based recommendations, and donation reminders, users can interact with the app easily and efficiently. The intelligent logic supports the system by analyzing clothing data, usage frequency, weather conditions, and user preferences. This allows ReHue to recommend suitable outfits and identify clothes that have not been worn for a long period. When an item remains unused for more than 210 days, the system triggers a donation notification. By combining user-friendly design with rule-based logic, ReHue encourages sustainable fashion behavior and helps reduce textile waste.

A. System Architecture and Interface Design

The UI/UX design of the ReHue mobile application prototype was developed through a user-centered approach to ensure that the application is practical, visually clear, and easy to use by its target users, especially college students who are interested in sustainable fashion. The design process began with the creation of high-fidelity mockups using Figma, a collaborative design platform that allows designers to arrange visual layouts, navigation structures, color schemes, typography, and interactive components in a systematic manner [10]. Through this stage, the main features of ReHue, such as digital wardrobe management, outfit recommendation, clothing usage tracking, donation reminders, and reward-based donation flow, were visualized before entering the development phase.

After the visual interface design was completed, the project continued to the functional implementation stage using a modern frontend architecture [11]. The ReHue system is proposed to be developed using React Native, a JavaScript-based cross-platform framework that enables mobile applications to run on both Android and iOS devices from a single codebase [12]. This technology was selected because it can improve development efficiency, reduce repeated coding work, and support consistent performance across different mobile operating systems [13], [14], [15]. By using React Native, the prototype can be developed more flexibly while maintaining usability and application stability.

In addition to interface and frontend development, the system architecture is also prepared to support integration with third-party Application Programming Interfaces (APIs). These APIs can be used to connect ReHue with external services such as weather data, calendar reminders, and payment systems [16]. Weather integration allows the application to provide outfit recommendations based on real-time environmental conditions. Calendar integration can help users plan clothing choices according to daily activities, while payment service integration may support donation rewards or incentive mechanisms.

Overall, the UI/UX and system development of ReHue are designed to combine usability, intelligent logic, and sustainable fashion behavior. The interface helps users manage their clothing easily, while the system logic supports personalized recommendations and donation notifications. Through this combination, ReHue is expected to encourage users to make more responsible fashion decisions and reduce textile waste.

B. Logic of Clothing Recommendation System

A recommendation system is a core component that a modern smart wardrobe application must have [17]. To

suppress users' impulsive shopping habits, ReHue presents the Virtual Personalized Fashion Styling feature [18], [19].

In contrast to the Collaborative Filtering method or Hybrid system which relies heavily on large-scale data exchange between users [20], [21], this prototype adopts rule-based filtering logic. This algorithm operates by directly processing IF-THEN logic conditions. The system will dynamically combine weather data retrieved through a third-party API with the user's clothing color profile attributes in a local database [22].

C. Threshold-Based Tracking

In addition to daily recommendations, ReHue also integrates an intelligent tracking system (Intelligent Wardrobe Detection) to monitor neglected clothes in the wardrobe [23]. This system works using a threshold-based time tracking algorithm. The algorithm calculates the time difference from the last worn date of each clothing item. If the calculated time reaches the tolerance threshold of 210 days (7 months), the system will automatically trigger a reminder notification [24]. This reminder then directs users to the clothing donation feature.

III. RESULT AND DISCUSSION

The implementation of the ReHue prototype design resulted in a smart clothing management system that integrates visual aesthetic aspects with functional logic to support a sustainable lifestyle.

A. User Interface Design (UI/UX) Result

The main outcome of this research is a high-fidelity mockup that captures the user journey from clothing inventory to donation. ReHue's interface design incorporates gamification elements to increase user retention and motivation in tracking the lifespan of their clothing [25][26]. The use of a clean color palette and modern typography aims to provide a pleasant user experience, while making it easier to navigate complex features such as weather sync, calendar and reward points system.

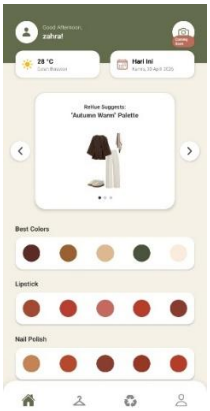

Fig. 1 User Dashboard Display

The implementation of the Rule-Based Filtering algorithm in ReHue was evaluated through various scenarios to ensure the accuracy of the resulting recommendations according to the predetermined parameters. The results of this logic mapping are summarized in the table below :

TABLE I
RULE-BASED RECOMMENDATION LOGIC SCENARIOS

User Profile (Personal Color)	**Environmental Condition (Weather)**	**System Output (Clothing Recommendation)**
Warm Spring	Sunny / Hot (32°C)	Light Linen Shirt (Earth Tone), Shorts
Cool Winter	Rainy / Cold (18°C)	Wool Sweater (Navy/Emerald), Heavy Trousers
Deep Autumn	Cloudy (24°C)	Cotton Cardigan (Terracotta), Chino Pants
Clear Summer	Sunny / Hot (30°C)	Breathable T-shirt (Soft Blue), Skirt/Shorts

B. Notification System and User Engagement

One crucial outcome of this prototype was the implementation of an automated, real-time alert system. To ensure users remain engaged with their apparel, the notification system was designed to maintain user engagement [26]. The notification trigger logic after 210 days of no use serves as a real-time alert system that helps users in making decisions to curate the contents of their wardrobe [27]. With consistent reminders, the risk of accumulating unused clothes can be proactively minimized.

Fig. 2 Intelligent Wardrobe Alert

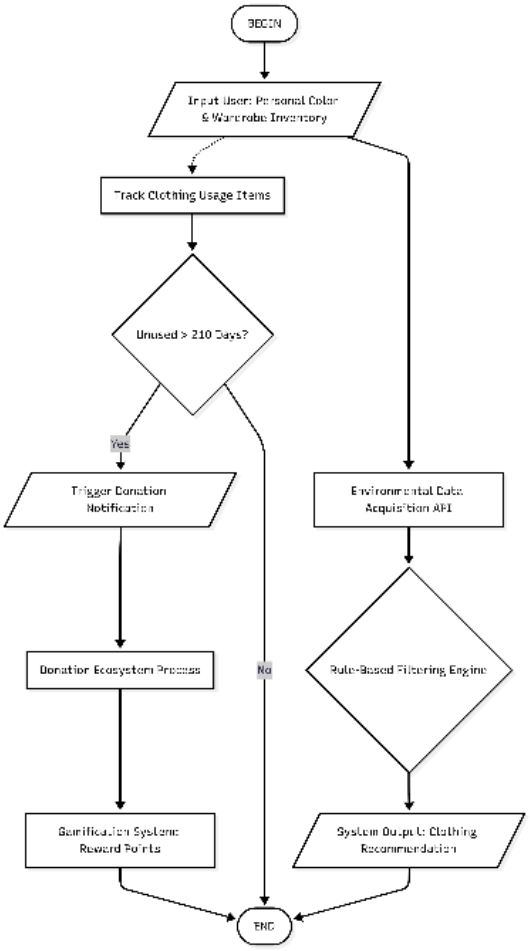

Fig. 3 Flowchart ReHue

Fig. 4 Selecting Items for Donation

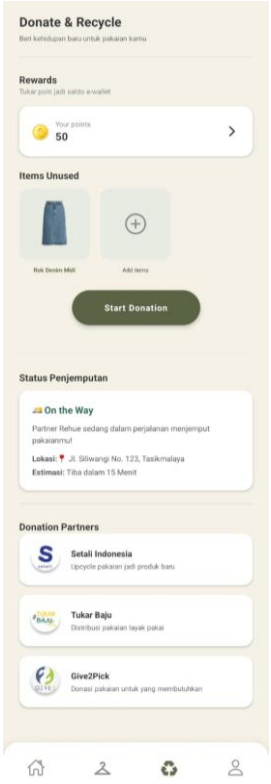

Fig. 5 Choosing Donation Partners

C. Donation Ecosystem and Circular Economy

Discussion about the donation feature on ReHue which is closely related to the concept of reverse logistics in the fashion industry [28]. This system not only focuses on removing items from the user's wardrobe, but also ensures that the clothes re-enter the circular economy cycle through the Collect-Resale-Redonate-Recycle mechanism [29]. To strengthen users' intention to donate, ReHue implements a gamification-based monetary reward design [30]. By awarding points that can be converted into digital balances, this system creates a real incentive for users to participate in environmental conservation through more responsible textile waste management.

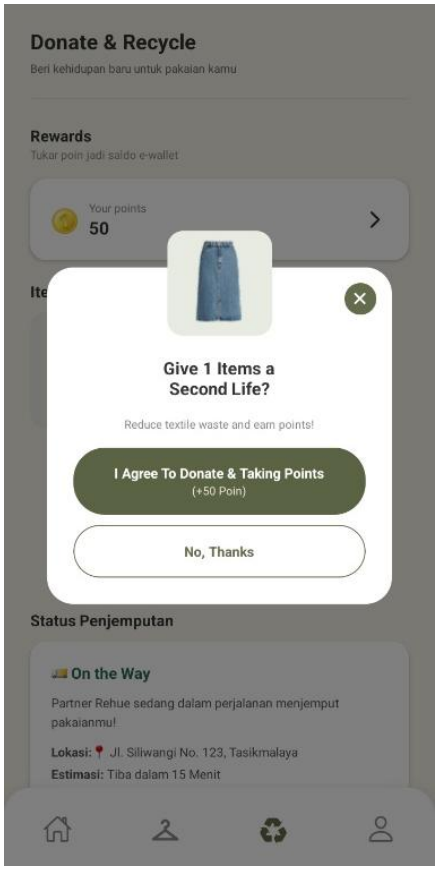

Fig. 6 Reward Points Confirmation

TABLE II
SYSTEM DEVELOPMENT SPECIFICATIONS

Category	**Specification**
Operating System	Windows 11 / macOS
UI/UX Design Tool	Figma (High-Fidelity Mockup)
Frontend Framework	React Native & Expo
Programming Language	JavaScript (ES6+)
Code Editor	Visual Studio Code

Overall, the integration of the visual interface and functional logic in the ReHue prototype demonstrates significant potential in supporting sustainable lifestyles. The system's success in processing logical scenarios demonstrates that the Rule-Based Filtering approach is an effective and efficient method to implement. Furthermore, the technical specifications used in the development ensure that the application has a strong foundation for further development into a mass-market product.

IV. CONCLUSION

This research has successfully designed and developed a prototype of the ReHue mobile application as an innovative digital solution to address the textile waste crisis through a sustainable fashion approach. Test results show that the implementation of the Rule-Based Filtering algorithm is able to provide accurate clothing recommendations by integrating personal color profiles and real-time environmental data. In addition, the inventory tracking feature with a 210-day threshold has proven effective as a proactive trigger to encourage donation activities, supported by a gamification system in the form of reward points.

Technically, the development architecture described in Table II ensures the application is lightweight and responsive. The main conclusion of this study is that the integration of information technology and the circular economy concept can transform consumer behavior into more ecological actions. As a suggestion for future development, the ReHue system can be improved by integrating more complex Machine Learning models for deeper personalization and expanding the reverse logistics network to facilitate a more integrated physical donation process with local partners on the ground.

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