

# Evaluation of the Implementation of Sustainable UI/UX Principles in Environmental Awareness Applications: A Case Study of the Plasticpay App

**Hagyana Allyssa Salwa**

Information System, Faculty of Computer  
Science, Brawijaya University  
Veteran Street, Malang City, Indonesia,  
65145

[hagyana@student.ub.ac.id](mailto:hagyana@student.ub.ac.id)

**Intan Sartika Eris Maghfiroh\***

Information System, Faculty of Computer  
Science, Brawijaya University  
Veteran Street, Malang City, Indonesia,  
65145

[intansartika@ub.ac.id](mailto:intansartika@ub.ac.id)

**Buce Trias Hanggara**

Information System, Faculty of Computer  
Science, Brawijaya University  
Veteran Street, Malang City, Indonesia,  
65145

[buce\\_trias@ub.ac.id](mailto:buce_trias@ub.ac.id)

**Almira Syawli**

Information System, Faculty of Computer  
Science, Brawijaya University  
Veteran Street, Malang City, Indonesia,  
65145

[a.syawli@ub.ac.id](mailto:a.syawli@ub.ac.id)

## Abstract

*Plastic bottle waste remains a major environmental challenge in Indonesia, prompting the emergence of digital recycling platforms such as Plasticpay. While prior studies emphasize usability, limited research empirically evaluates the implementation of Sustainable UX principles in environmental awareness applications. This study assesses the extent to which Plasticpay applies five Sustainable UX principles using a mixed-method approach combining heuristic evaluation (three experts) and a user perception survey (n=102). The evaluation identified 20 unique issues, including one catastrophic, two major problems, three minor problems related to user feedback, accessibility, and dark mode adaptation. In contrast, survey results showed high user agreement across principles (mean scores ranging from 4.1 to 4.4 on a 5-point scale). The findings reveal a discrepancy between expert-identified sustainability issues and positive user perceptions. Design recommendations are proposed to enhance sustainable interaction and user engagement through clearer system feedback, improved location filtering, dark mode support, and gamified environmental engagement.*

**Keywords:** Sustainable UX, Heuristic Evaluation, Environmental Awareness Application, User Perception, Digital Sustainability

## Introduction

Plastic waste remains a persistent environmental challenge in Indonesia, with plastic bottles constituting a significant portion of recyclable waste streams. Based on SIPSN data, in 2025, plastic waste composition nationally ranked second after food waste at 19.99% ([Sistem Informasi Pengelolaan](#)

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\* Corresponding Author

[Sampah Nasional \(SIPSN\), 2025](#)). Beyond conventional waste management strategies, digital platforms have increasingly been introduced to encourage public participation in recycling activities. One such initiative is Plasticpay, a mobile application integrated with Reverse Vending Machines (RVMs) that incentivizes users to exchange plastic bottles for reward points. By combining environmental goals with digital interaction, such platforms position information systems as enablers of sustainable behavior.

Plasticpay was launched on July 9, 2019, on the Google Play Store. It aims to encourage the public to exchange plastic bottles through an integrated Reverse Vending Machine (RVM). This application supports participation and collaboration in recycling activities to meet sustainable development goals. Plasticpay involves various parties, from individuals, communities, business partners, and the government, with the aim of reducing plastic waste while raising public awareness of the importance of recycling ([PT Plasticpay Teknologi Daurulang, 2025](#)). Despite their potential, the effectiveness of environmental awareness applications depends not only on functional usability but also on how sustainability principles are embedded within the user interface and user experience design. Recent studies highlight the importance of Sustainable UX in minimizing digital resource consumption, enhancing accessibility, and promoting environmentally responsible behavior through interaction design ([Ghai & Modgil, 2025](#)). However, empirical evaluations of Sustainable UX implementation in real-world recycling applications remain limited. Existing research predominantly focuses on usability testing or design thinking approaches, with little integration between sustainability-oriented UX principles and systematic evaluation methods.

This gap is particularly relevant for incentive-based environmental applications, where user engagement may be influenced by rewards rather than by sustainable interaction quality. Consequently, it becomes important to examine whether such applications genuinely implement Sustainable UX principles or merely achieve positive user perception through incentive mechanisms. Accordingly, this study investigates the following research question: *To what extent does the Plasticpay application implement Sustainable UX principles, and how do expert evaluations compare with user perceptions of its sustainability-oriented design?*

To address this question, this study employs a mixed-method approach combining heuristic evaluation based on Sustainable UX principles and a user perception survey. By integrating expert-based assessment with quantitative user feedback, this research contributes in three ways. First, it provides an empirical operationalization of Sustainable UX principles in the context of a digital recycling platform. Second, it examines the alignment between expert-identified sustainability issues and user-perceived experience quality. Third, it offers design recommendations to enhance sustainable interaction while maintaining user engagement in environmental awareness applications.

## **Literature Review**

### ***Sustainable UX in Digital Sustainability Context***

Sustainability refers to meeting present needs without compromising the ability of future generations to meet theirs ([Frick, 2016](#)). In the context of information systems, sustainability extends beyond environmental discourse into the design and operation of digital technologies that minimize negative environmental impacts while maintaining system effectiveness. Sustainable UX design seeks to reduce digital waste, lower carbon footprints, and promote energy-efficient interaction without sacrificing user experience quality ([Kiourtis et al., 2024](#)).

Rather than focusing solely on usability and task completion, Sustainable UX integrates ecological awareness into interaction design. This approach encourages designers to consider how interface elements, system architecture, and user flows influence energy consumption and digital resource usage ([Miquel, 2024](#)). Sustainable UX also plays a behavioral role by raising user awareness regarding the environmental consequences of digital activities, thereby encouraging environmentally responsible actions.

[Ghai & Modgil \(2025\)](#) identify five key principles of Sustainable UX: energy efficiency, material efficiency, longevity and durability, accessibility and inclusivity, and user-centric feedback. Energy efficiency emphasizes reducing computational load and optimizing system performance through

lightweight components and efficient navigation. Material efficiency promotes minimalist design by eliminating unnecessary interface elements that increase digital resource consumption. Longevity and durability focus on scalable and maintainable design to reduce frequent redesign cycles. Accessibility and inclusivity ensure broad usability across diverse user groups, minimizing the need for alternative versions of the same product. Finally, user-centric feedback highlights the importance of real-time information and adaptive interaction to guide users toward sustainable behavior. Although these principles provide a conceptual foundation, empirical operationalization within real-world environmental awareness applications remains limited.

### ***Evaluation of UX and Sustainability-Oriented Interaction***

User interface and user experience evaluation plays a critical role in ensuring that digital systems meet both functional and experiential requirements. Heuristic evaluation, introduced by [Nielsen \(1992\)](#), is a widely used inspection method in which experts identify usability problems based on established principles. This method has been applied in various contexts, including the evaluation of medical devices to enhance safety and usability ([Zhang et al., 2003](#)).

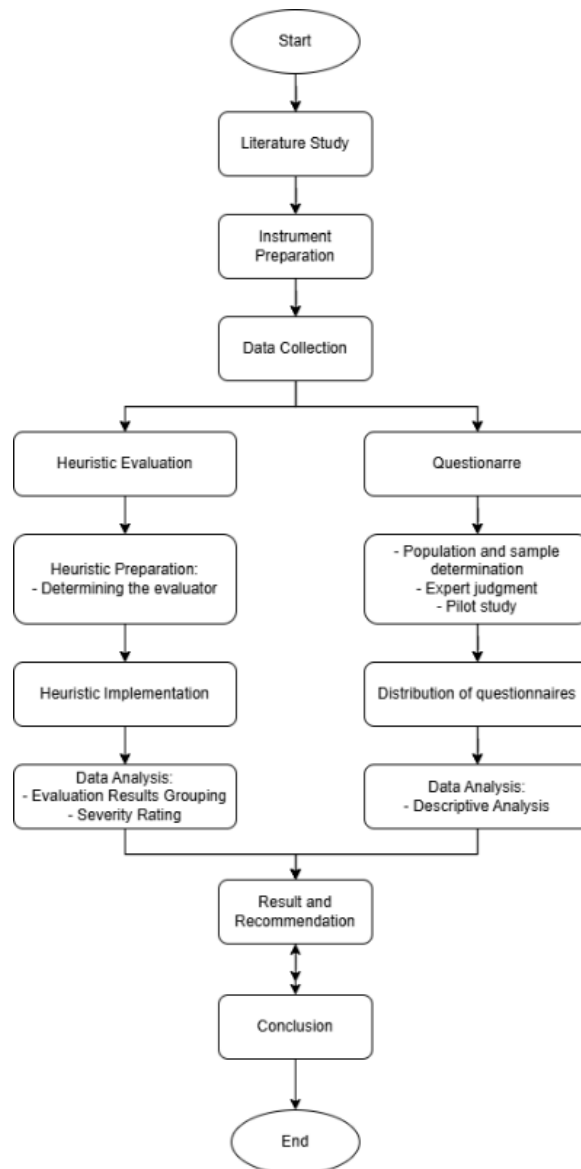
In sustainability-oriented systems, evaluation must go beyond conventional usability dimensions. Applications designed to promote environmental awareness are expected not only to be efficient and usable but also to embed features that encourage sustainable behavior and reduce digital resource consumption. Previous studies on waste management applications have primarily focused on usability improvement or design thinking approaches ([Adjie et al., 2025](#); [Alfirahmi et al., 2023](#)). Similarly, digital waste management initiatives emphasize environmental awareness and community participation ([Ramadhan & Lestari, 2025](#)). However, systematic evaluation of how Sustainable UX principles are implemented in such applications remains underexplored.

Accessibility evaluation, for example, is closely linked to inclusive design standards such as WCAG guidelines ([WCAG, 2025](#)), ensuring that digital systems can be accessed by users with diverse abilities. In the context of sustainability, accessibility is not merely a usability concern but also a mechanism to avoid digital redundancy and resource inefficiency ([Ghai & Modgil, 2025](#)). Therefore, integrating sustainability-oriented criteria into heuristic inspection provides a more comprehensive evaluation framework.

### **Methodology**

As shown in [Figure 1](#), this study employs a mixed-method approach to obtain a comprehensive evaluation of Sustainable UX implementation in the Plasticpay application. The combination of qualitative and quantitative methods enables triangulation between expert-based interface inspection and user perception measurement ([Sugiyono, 2023](#)). While heuristic evaluation captures interface-level sustainability issues identified by experts, it does not fully reflect how users perceive and experience these issues. Therefore, quantitative user perception data are included to complement the expert assessment. A convergent design was applied, in which heuristic evaluation and questionnaire data were collected independently and then integrated during the analysis stage to compare expert findings with user assessments. This design aligns with the research objective of examining both structural sustainability issues within the interface and users' perceived experience of Sustainable UX principles.

Heuristic evaluation is a UI/UX design inspection method involving 3-5 evaluators to identify interface issues based on sustainable UX principles and assess the severity of emerging issues ([Zhang et al., 2003](#)). Preparation included identifying evaluators and providing an assessment instrument sheets containing several specific assessment indicators as a reference for evaluators in identifying interface issues for each sustainable UX principle. These indicators are compiled by referring to previous literature related to sustainable UX, particularly studies by Ghai & Modgil and Miquel, as well as design guidelines, namely the Web Content Accessibility Guidelines (WCAG). In the implementation phase, evaluators explored the application to identify issues based on sustainable UX principles, assigning severity rating, and give recommendations for improvement. The results were analyzed by categorizing the issues and returning them to the evaluators for validation. The average severity rating was then calculated to determine the priority of issues for improvement recommendations.



**Figure 1. Method Flow**

A questionnaire was distributed to collect data related to user perceptions of the implementation of Sustainable UX in the application, which can be used to support the results of the heuristic evaluation (Hartanto, 2024). The population and sample size were determined using the Slovin formula with a 10% margin of error, resulting in 100 respondents and the target respondents in this study being Plasticpay Android users. The Slovin formula still allows for flexibility in determining the margin of error value to be used, so considering time constraints and respondent access, the researcher used a 10% margin of error (Hartati, 2021). Furthermore, the questionnaire instrument, shown in Table 1, underwent expert judgment to assess the appropriateness of the prepared statements. A pilot study was conducted with 30 respondents to test validity and reliability. Invalid statements were removed, leaving only valid statements to be distributed to the 100 respondents. The questionnaire results were analyzed using descriptive statistics by calculating the median, standard deviation, and mean for each sustainable UX principle.

**Table 1. Questionnaire Items**

<b>Sustainable UX Principle</b>	<b>Dimension</b>	<b>Statement</b>
Energy Efficiency (S-1)	User Journey Efficiency	I feel this app has a clear and easy-to-understand user flow.
		I feel this app makes it easy for me to complete tasks quickly.
	Optimizes loading times	I feel this app responds quickly.
		I feel this app doesn't use excessive images or videos.
Material Efficiency (S-2)	Efficiency of Design Elements	This application uses simple elements for easy understanding.
		I feel the use of icons or symbols in this application is appropriate and does not interfere with the application's functionality.
	Minimalism Design	I feel this application has a simple, attractive, and consistent interface design.
		I feel this application displays information clearly without excessive elements.
Longevity and durability (S-3)	Maintainability	I find this app rarely experiences errors.
		I find it has a consistent design, making it easy to adapt to updates.
	Scalability	The information displayed is clearly structured, so I don't feel confused when using it.
This app is relevant to my needs, so I can use it for a long time.		
Accessibility and Inclusivity (S-4)	Universal desain	I found the app's interface very user-friendly and understandable for all users.
		I found it easy to customize the app's usage to suit my needs or preferences (e.g., the filter feature makes searching easier).
	Accessible	I found the buttons in the app to be clearly colored.
		I found the app's flow to be clear, making menus and services easily accessible.
I could clearly read the text displayed in the app.		
User Centric Feedback (S-5)	Feedback Loops	I receive information or feedback after completing an activity.
		The information displayed helps me understand the impact of my actions.
	Persuasive behavioral	I feel this app helps me understand the achievements of my activities.
		I feel the information displayed motivates me to increase my environmental stewardship.

Additionally, open-ended questions were asked about user motivation, loyalty, and challenges encountered when using the app. These open-ended questions served to gain deeper insight into user perceptions and provide qualitative context for the questionnaire results.

To address the research question, findings from the heuristic evaluation and questionnaire survey were compared. The heuristic evaluation identified structural sustainability issues within the application, while the survey results reflected users’ perceived experience of Sustainable UX implementation. By examining the alignment or discrepancy between expert severity ratings and user agreement levels, the study provides a more comprehensive understanding of sustainability-oriented interaction design in the Plasticpay application. Finally, design improvement recommendations were formulated based on prioritized heuristic findings, supported by user perception data and relevant literature.

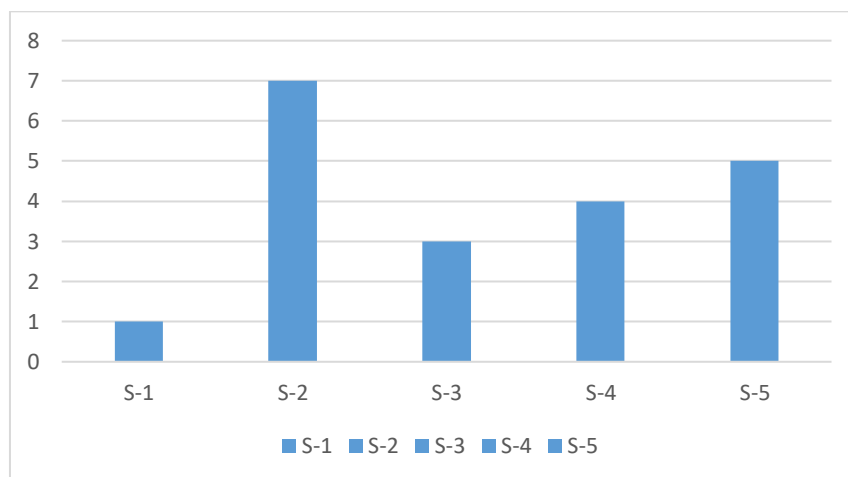
## Result

### Heuristic Evaluation

The heuristic evaluation was conducted by 3 evaluators who work as lecturers who are experts in the field of UI/UX and company employees in UI/UX positions, and identified a total of 31 issues. The results of the consolidation phase, combining all issues, resulting 20 unique issues, which were returned to the evaluators for review and validation by assigning severity ratings to the issues identified by the other evaluators. Then, the average severity scores were calculated and grouped into specific categories, as shown in [Table 2](#), to determine priority issues for improvement recommendations. The severity level categories refer to the severity rating category proposed by [Zhang et al. \(2003\)](#). The results of the average severity ratings from the three evaluators along with the assigned severity categories are presented in [Table 3](#).

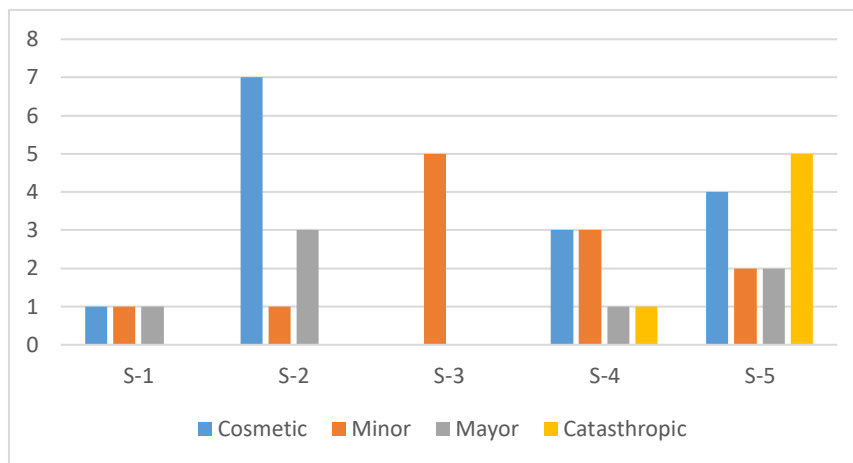
**Table 2. Severity Rating Criteria**

No	Interval Value	Severity Rating Category
1	Severity rating $\geq 3.5$	Catastrophic
2	$3.5 > \text{severity rating} \geq 2.5$	Mayor
3	$2.5 > \text{severity rating} \geq 1.5$	Minor
4	$1.5 > \text{severity rating}$	Cosmetic



**Figure 2. Comparison of Evaluation Problem Findings**

[Figure 2](#), shows a comparison of the number of issues found by three evaluators based on the Sustainable UX principles. The Material Efficiency principle (S-2) has the highest number of issues, namely seven findings, indicating that its implementation in the Plasticpay application is still not optimal, although most of the issues are of low severity. The Energy Efficiency principle (S-1) only has one issue, but it is categorized as Major, so it still needs attention even though the application's resource usage is generally quite good. In the Longevity and Durability principle (S-3), three issues were found with the highest severity level of Minor, which can affect the user experience and require improvement. The Accessibility and Inclusivity principle (S-4) has four issues with varying degrees of severity, which can affect user comfort in accessing the application. Meanwhile, the User Centric Feedback principle (S-5) has five issues with varying degrees of severity, thus indicating the need for improvements to improve the clarity of feedback and encourage more sustainable user behavior.



**Figure 3. Comparison of Severity Rating Numbers**

Based on [Figure 3](#), it is known that in the Energy Efficiency principle, 1 problem was found from each evaluator who gave different assessments ranging from Cosmetic to Major. In the Material Efficiency principle, 7 problems were found with the majority being categorized as Cosmetic. Then, the Longevity and Durability principle found 3 problems and the assessments given were homogeneous because there was only 1 type of category, namely Minor. Then, in the Accessibility and Inclusivity and User Centric Feedback principles, the assessments were quite diverse because they were all assessments. Catastrophic was the highest in the User Centric Feedback principle, meaning that the evaluators considered the Plasticpay application to be lacking in providing feedback to users.

**Table 3. Average Severity Rating**

Problem	Principle	SR	Category	Recommendation
When switching pages, there are animations that have the potential to increase cognitive load	S-1	2	Minor	Animation removed
Design elements are still stiff and empty state still too simple (text only)	S-2	0.33	Cosmetic	Design elements are tailored to the target user and create a more engaging empty state
There is no feedback animation on claim point	S-2	0.67	Cosmetic	Need animation for some processes such as claim points

<b>Problem</b>	<b>Principle</b>	<b>SR</b>	<b>Category</b>	<b>Recommendation</b>
There is no detailed guide regarding the mechanism disposal and facilities	S-2	2	Minor	There are guidelines regarding the mechanism disposal trash in apps that can be implemented with pop ups
Button shadow is too strong	S-2	0.67	Cosmetic	Shadow removed for consistency
Lack of icons that can help users	S-2	0.67	Cosmetic	Add icon
Not yet implemented consistent design system	S-2	0.67	Cosmetic	Use icons with the same style and apply them to all page
Achievements are in poster form and lack of highlighting of information	S-2	1	Cosmetic	Should highlight user achievements rather than banners and other less relevant information
There are still some things that are not possible when adding features, for example adding payment gateway options	S-3	0.67	Cosmetic	Use 1 button that when clicked will display payment gateway list
The History Page is printed at the bottom of the screen	S-3	1.3	Cosmetic	History is placed at the top of the screen
The order of point exchange on e-payment is inconsistent	S-3	1.3	Cosmetic	Made consistent for the order in e payment
History Page not yet display bottom navigation	S-4	1	Cosmetic	Show bottom navigation
Button is inconsistent because there are those who use icons and not, and the colors are too varied	S-4	0.67	Cosmetic	When the buttons are in the same condition, it is better to make them consistent and use only the same color, use primary and secondary
Font size is very small	S-4	0.67	Cosmetic	Enlarged letters
The location filter doesn't work and is set based on province so the results do not match the user's	S-4	3	Major	Gives users access to measure the location manually
There is no information on product that are not yet running	S-4	4	Catastrophic	Give detailed information to the user, for example if the feature is not working fully
There is no information that claim points have been recorded in the app	S-5	1	Cosmetic	There must be feedback every time a user completes a major activity
Is it on achievement subtraction footsteps carbon or land saved will	S-5	0.67	Cosmetic	There is a difference icons and images when

Problem	Principle	SR	Category	Recommendation
change the icon or animation plastic hero champion?				you have reached a certain level
Not adaptive to dark mode 3.3 Major	S-5	3.3	Major	Follow theme colors according to user preferences
Encouragement users to protect the environment 2.3 Minor Exchange feature highlights trash, points earned by users, and claim rewards that	S-5	2.3	Minor	Exchange feature highlights trash, points earned by users, and claim rewards that have small nominal values such as stickers

Based on the average value above, there are 6 priority problems for which recommendations for improvement are given that are shown in [Table 4](#).

**Table 4. Design Improvement Priorities**

Code	Problem	Principle	Severity Rating	Category
SP-1	There is no information on product features that are not yet running	S-5	4	Catastrophic
SP-2	Not adaptive to dark mode	S-5	3.3	Major
SP-3	The location filter doesn't work and is set based on province so the results do not match the user's	S-4	3	Major
SP-4	Not enough to encourage users to protect the environment	S-5	2.3	Minor
SP-5	When switching pages, there are animations that have the potential to increase cognitive load	S-1	2	Minor
SP-6	There is no detailed guide regarding the mechanism disposal and facilities	S-2	2	Minor

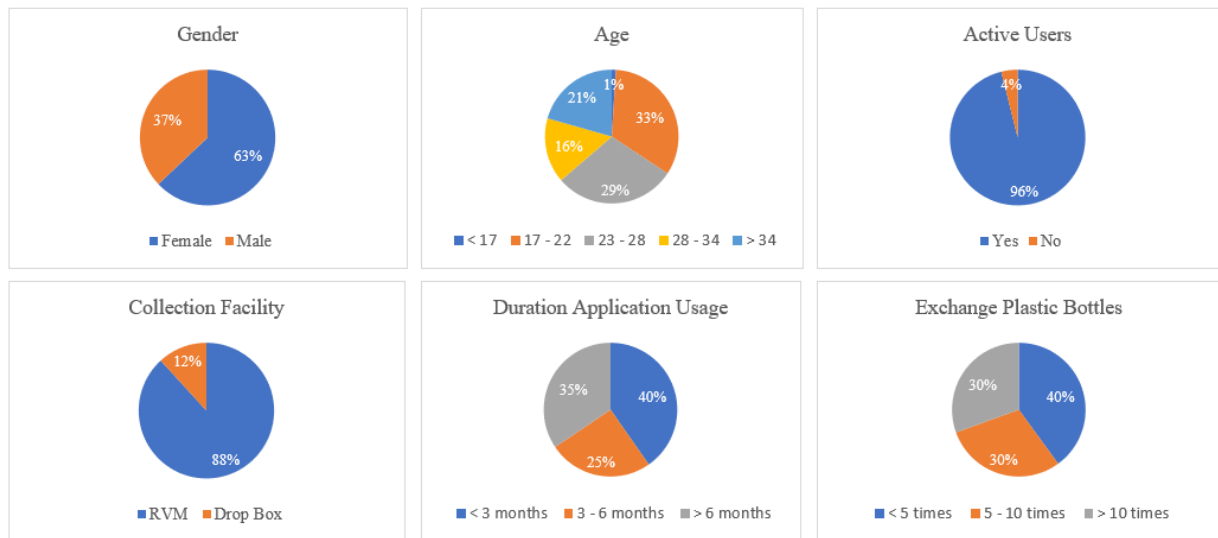
In SP-1, the recycled product feature malfunctioned with the "Buy" button, which didn't display the product information page. All three evaluators agreed that this disrupted the user experience, as the purchase flow wasn't clear. From a sustainability perspective, this failed to meet the principles of User-Centeredness and Feedback, as the interface didn't adapt to user behavior and preferences.

In SP-2, the app does not activate dark mode when the device is set to dark mode, indicating a lack of adaptation to user preferences. Dark mode is also related to Energy Efficiency, as it can save energy on OLED devices ([Ghai & Modgil, 2025](#)). In SP-3, the Collection Facility filter is not clickable and is only set using user provinces, which can limit customization, resulting in a lack of user-friendly design principles and potentially creating digital waste due to the creation of alternatives to the same product.

In SP-4, the Achievements feature, which displays the number of bottles collected, land saved, and reduced carbon footprint, was deemed insufficient to motivate users to adopt sustainable behaviors in plastic bottle recycling. More persuasive information is needed to effectively influence user behavior. In SP-5, evaluators noted that animations during screen transitions can increase cognitive load. In SP-6, the lack of clear guidance on waste disposal and detailed information about collection facilities can make it difficult for users to understand and navigate the app.

### Questionnaire

The questionnaire instrument was assessed by experts to evaluate the feasibility of the statements in the questionnaire. The results showed that the questionnaire was feasible and could be distributed to respondents. Before distributing the questionnaire to 100 respondents, a pilot study was conducted on 30 respondents to test its validity and reliability. The validity results showed that there were 3 invalid statements and these statements were removed. The reliability test results indicated that all principles had a Cronbach's alpha value > 0.6, indicating that the principles were reliable and consistent in their measurement (Anggraini et al., 2022). Then, the questionnaire was distributed via direct messages on social media (Instagram, X, and TikTok) to Plasticpay users, so that respondents remained in line with the application's target users. A total of 102 respondents were successfully collected with the characteristics shown in Figure 4.



**Figure 4. Characteristic Respondents**

The questionnaire results were analyzed using descriptive statistics by calculating the median, standard deviation, and mean to describe the questionnaire data. Descriptive statistics were chosen because the aim of this study was to provide an overview of user perceptions in using the Plasticpay application. Based on the mean, the data were grouped into categories to determine the level of user agreement with the implementation of sustainable UX principles in the Plasticpay application, shown in Table 5.

**Table 5. Statistical Analysis Descriptive**

Sustainable UX Principle	Median	SD	$\bar{x}$	Category
Energy Efficiency	4	0.53	4.35	Strongly agree
Material Efficiency	5	0.54	4.4	Strongly agree
Longevity & Durability	4	0.6	4.1	Agree
Accessibility & Inclusivity	4	0.56	4.27	Strongly agree
User Centric Feedback	4	0.47	4.36	Strongly agree

All principles received positive assessments from respondents as indicated by median values of 4 and 5, meaning many respondents answered Agree and Strongly Agree. Then, the standard deviation was relatively low with a range of 0.47 to 0.6 indicating that the variation in respondents' answers was quite consistent and not too varied. In the results of the average value, all were at 4 and most were in the

Strongly Agree category. This shows that the Plasticpay application is very good in implementing sustainable UX so that respondents can give positive assessments on the principles of Energy Efficiency, Material Efficiency, Accessibility and Inclusivity, and User-Centered Feedback. Meanwhile, the Longevity and Durability principles were in the Agree category, meaning respondents considered the Plasticpay application quite good in terms of durability and consistency of use, although there are still areas for better improvement.

## **Discussion**

The findings reveal an important tension between expert-based evaluation and user perception. The heuristic evaluation identified 20 unique issues, including one catastrophic, two major, and three minor problems primarily related to user-centric feedback, accessibility, and dark mode adaptation. In contrast, survey results indicated consistently high user agreement across all five Sustainable UX principles, with mean scores ranging from 4.1 to 4.4. This discrepancy suggests that positive user perception does not necessarily reflect optimal sustainability-oriented design implementation. One possible explanation lies in the incentive-based nature of the Plasticpay application. As users receive tangible rewards in the form of redeemable points, their evaluation of the application may be influenced by perceived benefits rather than by structural interface quality. Prior research indicates that user satisfaction and continued usage can be strongly shaped by engagement mechanisms and perceived value ([Hartanto, 2024](#)). In this context, reward-driven motivation may reduce users' sensitivity to design inconsistencies or sustainability-related inefficiencies.

From a Sustainable UX perspective, this finding highlights a critical distinction between perceived sustainability and structural sustainability. While users strongly agreed that the application supports sustainable behavior, expert evaluation revealed shortcomings in accessibility, adaptive theming, and feedback transparency. For instance, the absence of dark mode adaptation contradicts energy efficiency principles ([Ghai & Modgil, 2025](#)), and incomplete feature transparency weakens user-centric feedback mechanisms. These structural limitations may not be immediately recognized by users but can affect long-term digital sustainability.

The concentration of major and catastrophic issues within the User-Centric Feedback and Accessibility principles also indicates that sustainability-oriented interaction extends beyond minimalist design. Accessibility limitations and insufficient transparency may reduce inclusivity and hinder sustained behavioral engagement, particularly for diverse user groups ([WCAG, 2025](#)). Thus, implementing Sustainable UX requires not only efficient resource use but also adaptive, transparent, and inclusive system design.

The findings also suggest that Sustainable UX evaluation benefits from integrating expert inspection with user perception measurement. Heuristic evaluation effectively identifies hidden structural weaknesses, whereas user surveys capture experiential acceptance. Relying solely on user satisfaction metrics may overlook deeper sustainability issues embedded within interface architecture. Overall, this study demonstrates that sustainability-oriented digital platforms can achieve high perceived acceptance while still exhibiting structural sustainability gaps. Addressing these gaps is essential to ensure that environmental awareness applications do not merely promote sustainable behavior symbolically, but also embody sustainability principles within their interaction design.

## ***Design Recommendation***

For the SP-1 improvement recommendations shown in [Figure 5](#) are given by implementing the adaptive interface concept by providing information if the product is not yet available and displaying a "Buy" button if the product can be purchased by the user. With this improvement, it is hoped that the system will provide information responses according to the feature conditions and user actions so that it can reduce confusion and unnecessary interactions ([Ghai & Modgil, 2025](#)).

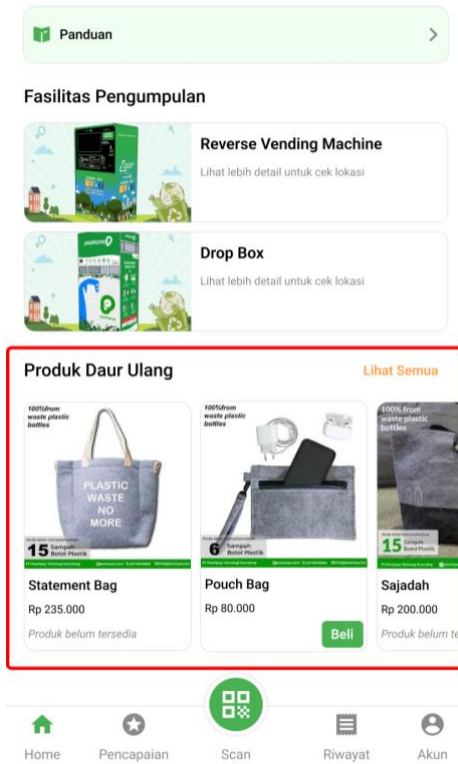


Figure 5. SP-1 Information Product

In SP-2, shown in [Figure 6](#), recommendations are given to provide an adaptive display, either automatically or manually changing the display in the application settings ([Ghai & Modgil, 2025](#)). The application settings provide a "Display" menu that contains options to change the display to dark mode, light mode, or using device settings. This improvement is expected to provide visual comfort and improve the user experience, especially for users who are more sensitive to light.

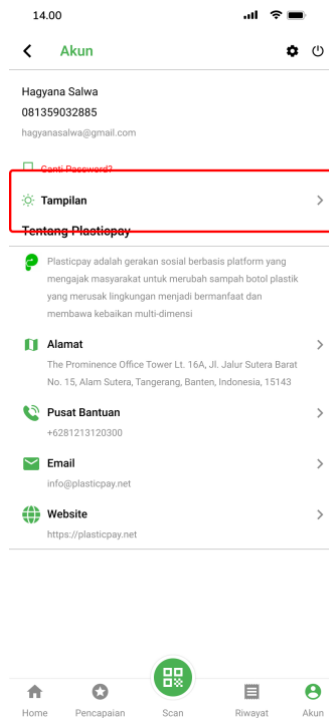


Figure 6. SP-2 Display Settings

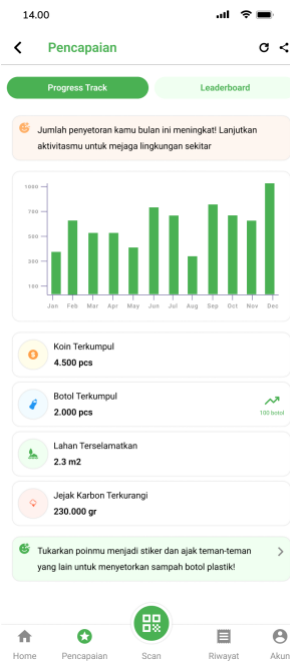
In [Figure 7](#), recommendations for SP-3 are given with reference to WCAG 3.2.5 regarding Change on Request. The system can enable a facility location filter dropdown display that displays a pop up to select the facility location based on Province and City, or uses the current location to display the nearest Plasticpay facility. With this improvement, it is hoped that users will not feel difficult when they want to search or find the location of the facility, especially if the collection facility is located in a large area.



**Figure 7. SP-3 Pop Up Set Location**

In SP-4, shown in [Figure 8](#), recommendations are given for implementing Feedback Loops by adding gamification in the form of competitive challenges and progress tracking. This feedback is displayed to provide information on energy use or environmental impact, which can help foster sustainable behavior patterns and motivation through healthy competition in waste exchanges ([Ghai & Modgil, 2025](#); [Sya'bani & Utami, 2025](#)). Furthermore, small prize claims, such as campaign stickers, are added, which are expected to help users express their involvement in the action and encourage close relatives to deposit plastic bottles at Plasticpay through one or more stickers deemed attractive ([Kartika, 2024](#)).

In SP-5, improvements were made by eliminating transition animations when moving between pages and instead using instant transitions. This improvement is expected to reduce cognitive load by reducing the number of repeated transition interactions and improving load time optimization ([Kiourtis et al., 2024](#)).



**Figure 8. SP-4 Progress Tracking**

In SP-6 shown in [Figure 9](#), recommendations for improvement are given by adding a guide menu explaining how to deposit bottles through facility location and the point exchange, as well as detailed information on the Collection Facility feature, with the addition of a tooltip or info icon, as shown in [Figure 10 \(Adjie et al., 2025\)](#). With this guide, it is hoped that users can know how to use the application and deposit plastic bottles before coming to the collection facility.



**Figure 9. SP-6 Guideline**



**Figure 10. SP-6 Pop Up Information**

## Conclusion

This study evaluates how Sustainable UX principles are applied in the Plasticpay application using heuristic evaluation and a user perception questionnaire. The results show that most issues found are cosmetic, which means the application has generally implemented Sustainable UX principles well. However, several major and one catastrophic issue were identified, especially related to user feedback and accessibility, indicating areas that still need improvement. User perception results support these findings, although some users reported difficulties in accessing features, understanding information, and system performance.

From a theoretical contribution, this study provides real examples of how Sustainable UX principles can be applied in an environmental mobile application. From a methodological contribution, this study shows that combining heuristic evaluation with user perception data is useful for evaluating Sustainable UX. From a practical contribution, this study offers clear and prioritized design recommendations to help developers improve sustainability-oriented user experience in Plasticpay.

This study is limited to one application, so the results may not represent other environmental platforms. In addition, the use of self-reported data and simple statistical analysis may not fully explain user behavior. Future studies should involve more applications and include behavioral data to strengthen the results.

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