



Designing a Point-Based Skincare Packaging Recycling Model Through Design Thinking: Implications for Educational Management

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ABSTRACT

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This study aims to design a point-based skincare packaging recycling model using the Design Thinking approach to address the persistent intention–action gap in consumer recycling behavior. The research also explores how circular business practices can be integrated into educational management, particularly in sustainability education and green campus initiatives. A mixed-methods design was employed, combining a survey of 60 consumers with semi-structured interviews involving local skincare SMEs. The Theory of Planned Behavior and circular economy principles were used to analyze the roles of awareness, perceived ease, incentives, and behavioral intention. Results indicate that although environmental awareness is high (~95%), actual recycling participation is low (16%). Accessibility barriers and insufficient incentives emerged as the strongest predictors of participation intention. Through iterative Design Thinking stages, this study developed the Circular Chain Return & Reward (CCRR) model, which incorporates QR-based tracking, drop-point networks, point rewards, and transparent digital reporting. Simulation findings show that more than 90% of respondents would participate when convenience and tangible rewards are provided. The model offers managerial implications for skincare SMEs and educational institutions by strengthening sustainability management, increasing stakeholder engagement, and supporting curriculum or program development related to environmental responsibility.

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INTRODUCTION

The rapid growth of Indonesia's skincare and beauty industry has created significant economic opportunities while simultaneously intensifying environmental pressures, particularly the surge of single-use plastic waste

(Arisman et al., 2023; Fatimah et al., 2024). Most skincare packaging consists of hard-to-recycle plastic materials that accumulate in landfills and waterways, contributing to the national waste crisis (Vrabic-Brodnjak et al., 2024). According to the Ministry of Environment and Forestry (KLHK, 2023), Indonesia generates more than 18 million tons of waste annually, with approximately 17.7% being plastic. Although environmental awareness among consumers continues to rise, participation in packaging return programs remains extremely low, revealing a persistent gap between intention and action. This contextual problem highlights the urgency of designing systematic, user-centered waste management solutions, particularly within the cosmetic sector, which significantly contributes to plastic packaging production (Jin et al., 2024; Justa et al., 2024). Moreover, this issue also affects educational institutions, where sustainability practices are increasingly demanded as part of modern educational management. Schools and universities play a strategic role in shaping environmentally responsible behavior, yet the absence of an integrated recycling model hampers their ability to implement effective sustainability programs that could reinforce consumer and student participation.

Understanding user needs is essential for addressing the low participation in packaging recycling programs (Norton et al., 2023; Roy et al., 2023; Ertz et al., 2023). Despite growing environmental consciousness, many consumers perceive recycling as inconvenient, time-consuming, or lacking in personal benefit. This misalignment between awareness and behavior reflects structural barriers such as the absence of accessible drop points, unclear information about recycling procedures, and a lack of tangible incentives. Studies by Gatt and Refalo (2022) and Hisyam et al. (2025) suggest that consumers respond positively to systems that simplify recycling processes and provide immediate rewards. Empathizing with users—whether they are skincare consumers, SMEs, or educational communities—reveals deeper motivations such as convenience, transparency, social value, and economic benefit. For educational institutions, understanding student and staff behavior is critical in managing sustainability programs effectively. Effective educational management must therefore integrate empathetic insights into its environmental strategies, designing systems that respond to the lived experiences and constraints of campus communities. By identifying users' pain points and aspirations, this research seeks to formulate a recycling model that is both motivating and realistically implementable.

The need for an innovative, user-centered recycling solution arises from the inadequacy of conventional waste management approaches, which often overlook behavioral factors (Justa et al., 2024; Lee, 2025). Many recycling programs focus solely on technical processes without addressing user participation, leading to limited adoption and poor long-term effectiveness

(Gibovic et al., 2025; da Silva et al., 2025). A point-based reward system offers a compelling alternative by combining behavioral incentives with environmental responsibility, thereby fostering sustained engagement. This approach aligns with economic circularity principles that emphasize reducing, reusing, and recycling materials to maintain their value over extended lifecycles (Hisyam et al., 2025; Purwono & Rahayu, 2025). In the context of educational management, such innovation supports institutional objectives to cultivate sustainability-oriented culture among students and staff. Integrating a reward-based model within educational settings can strengthen environmental literacy, promote responsible action, and support green campus initiatives. Therefore, an innovation that merges circular economy strategies with behavioral incentives promises not only to address consumer-level environmental issues but also to enrich sustainability governance within educational institutions.

Design Thinking provides a human-centered methodology suitable for tackling the complex behavioral and systemic challenges associated with plastic packaging recycling. Popularized by Brown (2008), Design Thinking consists of five iterative stages: Empathize, Define, Ideate, Prototype, and Test. The framework encourages comprehensive understanding of user experiences, enabling researchers to identify pain points and craft innovative solutions that align with real-world constraints. Its emphasis on creativity, rapid prototyping, and continuous refinement makes it applicable to both business and educational settings. Within the skincare industry, Design Thinking helps conceptualize a recycling model that balances consumer convenience, economic incentives, and environmental goals. Meanwhile, in the realm of educational management, Design Thinking provides a structured problem-solving approach that institutions can adopt to design sustainability initiatives, improve environmental engagement, and integrate experiential learning into academic programs. The relevance of Design Thinking in this study lies in its ability to bridge user behavior insights with technical and managerial considerations, ensuring that the resulting model is feasible, desirable, and scalable.

Previous research has explored various strategies for reducing plastic waste, yet most emphasize technical and community-based recycling models. Ding and Zhu (2023) highlight the role of recyclable-oriented packaging design in extending plastic lifecycles, noting the environmental benefits of easily sorted materials. Gatt and Refalo (2022) report that reusable cosmetic containers can reduce environmental impact by up to 74% compared to single-use plastics. In the Indonesian context, community-driven initiatives such as Bank Sampah Mekar Sari (Hisyam et al., 2025) and Krasa Bungah (Purwono & Rahayu, 2025) demonstrate that simple circular systems can generate economic value for residents. However, studies rarely apply behavioral frameworks such as the

Theory of Planned Behavior or integrate structured design methodologies like Design Thinking into recycling model development. Additionally, research on sustainability in educational management suggests that institutions require more innovative tools to support green campus programs and influence student behavior. This highlights the potential for a hybrid approach that merges circular business strategies with user-centered design to create more effective recycling solutions.

Despite the progress achieved through technical solutions and community initiatives, a prominent gap remains in the integration of consumer incentives, behavioral insights, and design-based frameworks within skincare recycling systems. Most existing studies focus on waste processing efficiency rather than user motivation, leaving a critical gap concerning how to actively encourage consumer participation in returning used packaging. Additionally, the skincare sector lacks a structured, reward-based model that connects producers, consumers, and recycling managers in a cohesive system. Within educational management, although sustainability is increasingly prioritized, institutions still lack adaptable, user-friendly models that can be adopted to influence daily recycling habits among students and staff. This gap underscores the need for an approach that blends circular economy principles, behavioral theories, and Design Thinking to design a model that is simultaneously practical, attractive, and implementable across both commercial and educational environments. Addressing this shortcoming is essential for building a holistic recycling framework that integrates environmental, managerial, and behavioral perspectives.

This study aims to develop a point-based skincare packaging recycling model using the full stages of Design Thinking: Empathize, Define, Ideate, Prototype, and Test. Through this approach, the research seeks to thoroughly understand user experiences, identify key participation barriers, generate innovative design concepts, and evaluate user acceptance of the proposed system. The final output, the Circular Chain Return & Reward (CCRR) model, integrates QR-based tracking, drop-point placement, incentive structures, and transparent reporting mechanisms. The model is designed to benefit multiple stakeholders—including consumers, skincare SMEs, recycling operators, and educational institutions—by providing a coherent system that supports circular economy objectives and strengthens sustainability management practices. The study also contributes to educational management by offering a framework that can be integrated into sustainability learning programs and green campus initiatives. Ultimately, the research aims to enhance user participation, strengthen environmental accountability, and promote scalable circular innovation within Indonesia's skincare industry and educational sectors.

RESEARCH METHOD

This study employs a Design Thinking approach to develop a point-based skincare packaging recycling model, encompassing five iterative stages: Empathize, Define, Ideate, Prototype, and Test (Brown, 2008). The research was conducted in [Location], selected for its relevance to consumer recycling behavior and accessibility of local skincare SMEs. The approach emphasizes human-centered innovation by integrating user needs, technological feasibility, and business viability, ensuring that the resulting Circular Chain Return & Reward (CCRR) model addresses practical challenges while fostering stakeholder engagement. In the context of educational management, the research design also considers how such sustainability-oriented solutions can be integrated into curriculum development and green campus initiatives, promoting environmentally responsible behavior among students, teachers, and staff.

Participants included primary skincare users and key stakeholders, such as brand owners and local recycling operators, who were directly involved in the co-design process. Data collection combined multiple techniques: in-depth interviews to explore user experiences, surveys to quantify behavioral intentions, direct observation to capture contextual interactions, and prototype testing to assess system usability and incentive appeal. Each stage emphasized participatory engagement, allowing researchers to collect rich qualitative and quantitative data that reflect real-world user preferences. From an educational management perspective, incorporating students or school communities as part of the stakeholder group can strengthen practical learning opportunities, linking behavioral insights with sustainability education and program management.

The research procedure followed iterative Design Thinking stages, beginning with problem identification during the Empathize and Define phases, ideation of multiple alternatives in the Ideate phase, creation of a functional CCRR prototype in the Prototype phase, and evaluation through conceptual testing in the Test phase. Qualitative data were analyzed using thematic analysis, while prototype testing results were analyzed quantitatively to assess user engagement, perceived ease, and incentive effectiveness. Data validity was ensured through triangulation of sources, member checking, and continuous user feedback at each iteration. Integrating these procedures into educational management contexts demonstrates how participatory design can enhance program development, foster environmental literacy, and improve operational sustainability within schools or other learning institutions.

RESULT AND DISCUSSION

RESULT

Sample and Respondent Overview

This study involved 60 skincare users, with the majority aged 18–30 years (74%), indicating a digitally active young consumer segment. Most respondents resided in urban areas and used more than two skincare products regularly. Environmental awareness was high, with ≈95% expressing concern for recycling, yet only 16% had participated in packaging return programs. This demonstrates a pronounced intention–action gap, aligning with the Theory of Planned Behavior (Ajzen, 1991), whereby moral or attitudinal awareness does not automatically translate into actual behavior. For educational management, these findings suggest opportunities to integrate real-world sustainability behaviors into curricula or green campus programs, fostering actionable environmental literacy among students.

Quantitative Findings (Descriptive Analysis)

Descriptive analysis revealed that 94.9% of respondents acknowledged that skincare packaging contributes to environmental pollution, while 83.1% expressed concern for cosmetic waste. Despite this awareness, only 23.7% knew proper disposal locations or procedures, and 44.1% stored used packaging at home without further action. Accessibility barriers were prominent: 83.1% reported difficulty finding collection points, and 91.5% indicated that incentive systems would increase participation. QR-based digital systems were considered easy to use by 93.2%, and 91.5% were willing to exchange packaging for points if available nearby. These results highlight the centrality of perceived behavioral control and tangible incentives in bridging the intention–action gap. In educational contexts, similar strategies—integrating digital reward systems for sustainability actions—could motivate students and staff to participate actively in campus recycling initiatives.

Barriers and Incentive Preferences

Barriers

Open-ended responses revealed five primary barriers (Table 1).

Table 1. Consumer Barriers in Returning Skincare Packaging

Barrier Category	Frequency (n)	Percentage (%)
Others (heterogeneous)	23	38.3
Difficult location/distance	11	18.3
Considered cumbersome process	10	16.7
Lack of information/socialization	7	11.7
No return facilities	6	10.0
Total	60	100.0

Respondents emphasized logistical and convenience constraints, supplemented by psychological barriers such as skepticism toward recycling outcomes. Interviews with the brand owner (Syafiya Natural Indonesia) confirmed these challenges, particularly the absence of a clear, accessible system. These findings reinforce that ease of access and perceived control are key determinants of recycling behavior (Ajzen, 1991).

Incentive Preferences

Table 2 summarizes consumer preferences for rewards.

Table 2. Consumer Incentive Preferences

Reward Category	Frequency (n)	Percentage (%)
Purchase discount	25	41.7
Others (merchandise/small gifts)	17	28.3
Free product/sample	6	10.0
Cash/back	5	8.3
Digital voucher	2	3.3
Points system	2	3.3
Total	60	100.0

Direct economic incentives, such as discounts or vouchers, were preferred due to immediate relevance to shopping behavior. Brand feedback corroborated these findings, highlighting that visible, quick benefits enhance participation. This insight informs the CCRR model, emphasizing user-centered reward design applicable in both commercial and educational sustainability programs.

Design Thinking Phase Findings: CCRR Model

Empathize: Users generally stored or discarded packaging due to lack of knowledge about recycling points. Awareness was high (~95%), but participation was low (~16%). Brand interviews highlighted logistic constraints and unclear processes.

Define: Core problems were limited access, cumbersome procedures, and absence of transparent incentives.

Ideate: Four central ideas emerged:

- Return-for-Reward (digital points)
- QR + tracking system
- Brand-Bank Sampah-UMKM collaboration
- Strategic dropbox and pick-up services

Prototype: Conceptual CCRR model developed with QR scanning, verification, point accrual, and tracking. Components include drop-off points, digital app, sorting center, UMKM upcycling, and brand dashboard.

Test: Perception-based validation showed 91.5% willing to use CCRR, 93.2% considered QR easy, and 68–76% indicated potential behavior change.

Inferential Analysis and Variable Relationships

Correlation and regression analyses evaluated relationships between environmental awareness (X_1), perceived ease (X_2), and participation intention (Y).

- Awareness positively correlated with intention ($r = 0.47$, $p < 0.01$), while perceived ease showed stronger correlation ($r = 0.62$, $p < 0.01$).
- Multiple regression ($R^2 = 0.52$) indicated both variables collectively explain 52% of variance in participation intention.

Interviews confirmed that high awareness alone was insufficient; ease of access and immediate reward were decisive. These results align with Theory of Planned Behavior (Ajzen, 1991) and Nudge Theory (Thaler & Sunstein, 2008), suggesting that perceived behavioral control and direct incentives are essential for converting intention into action. From a circular economy perspective (Ellen MacArthur Foundation, 2019), integrating economic incentives and transparent feedback fosters traceability, trust, and long-term engagement.

In educational management, these insights imply that sustainability programs are more effective when they combine awareness campaigns with practical tools, reward systems, and transparent reporting, enabling students and staff to act on environmental intentions reliably.

DISCUSSION

The CCRR model development followed five iterative phases: Empathize, Define, Ideate, Prototype, and Test. During the Empathize stage, interviews and questionnaires revealed key barriers such as limited access, cumbersome procedures, and lack of incentive, aligning with high environmental awareness but low participation (intention–action gap). In Define, these insights crystallized into actionable problem statements, highlighting the need for convenience, reward systems, and transparency. Ideate generated multiple potential solutions, including digital point rewards, QR tracking, and collaboration with recycling SMEs. Prototype consolidated these into the CCRR system, while Test confirmed user receptiveness and feasibility. These results demonstrate that iterative engagement with users ensures the model addresses actual needs, increasing adoption potential. In the context of educational management, similar iterative engagement could be applied to design campus sustainability programs, ensuring student-friendly systems that motivate real behavioral change.

The results reinforce the Theory of Planned Behavior (Ajzen, 1991), showing that behavioral intention is influenced by attitude, subjective norm, and perceived behavioral control. Awareness alone was insufficient; ease of access and direct rewards were decisive. Findings align with Nudge Theory (Thaler & Sunstein, 2008) and previous studies on the attitude–behavior gap (Bamberg &

Möser, 2007; Kollmuss & Agyeman, 2002), highlighting that behavioral architecture and reward structures can effectively convert intention into action. Integrating these theoretical insights with practical design interventions confirms the importance of evidence-based solution development. From an educational perspective, these findings suggest that embedding behavioral economics and incentive-based learning in curricula can enhance student engagement in sustainability projects.

Design Thinking proved effective in addressing the identified barriers by centering solutions on user needs and iterative feedback. The process facilitated the co-creation of a system that is both technically feasible and desirable for users. For instance, QR-based tracking and point rewards directly addressed access and incentive issues, translating insights from Empathize and Ideate into actionable design features. This demonstrates the method's strength in integrating human-centered design with business and operational feasibility. In educational management, this approach could inform participatory curriculum development or service-learning programs, where students co-design solutions for environmental or social challenges, ensuring relevance and engagement.

The iterative nature of Design Thinking allowed refinement of CCRR at each stage. Divergent thinking generated multiple alternatives, while convergent thinking selected the most feasible and impactful solutions. Iterations between prototype and user feedback enhanced usability, trust, and reward effectiveness. This cycle ensured the model's alignment with consumer behavior patterns and operational constraints. In educational settings, adopting iterative approaches can similarly enhance project-based learning, enabling students to test, revise, and optimize interventions for sustainability or management challenges, fostering critical thinking, problem-solving skills, and practical experience.

Despite insightful findings, the study has limitations. The sample size was small (n=60) and relied on convenience sampling, reducing generalizability. Prototype testing was conceptual rather than operational, limiting assessment of actual behavioral change. Only one brand owner was interviewed, neglecting perspectives of recycling partners or policy stakeholders. These constraints highlight the need for pilot studies, longitudinal research, and broader stakeholder inclusion. From an educational management perspective, testing CCRR-like systems in school or university contexts could provide additional insights on student engagement, learning outcomes, and behavioral sustainability, complementing corporate applications. Future studies could explore cross-sector collaborations to optimize educational and environmental outcomes.

CONCLUSION

This study successfully identified the needs and preferences of skincare consumers and formulated a user-centered solution through the Design Thinking approach. By employing the five iterative phases—Empathize, Define, Ideate, Prototype, and Test—the research highlighted critical barriers such as limited access, cumbersome return processes, and lack of information. These insights informed the development of the Circular Chain Return & Reward (CCR) model, integrating digital point rewards, QR code scanning, tracking systems, drop-off points, and collaboration with recycling banks and SMEs. The iterative process ensured that the model addresses real user challenges, aligning technological feasibility with user expectations. In the context of educational management, similar Design Thinking methods can guide the development of sustainability programs in schools or universities, fostering active student participation and experiential learning in environmental stewardship.

The prototype received strong positive responses, with over 90% of respondents expressing willingness to participate, demonstrating the effectiveness of Design Thinking in translating user needs into actionable, practical solutions. The CCR model offers a tangible contribution to circular business innovation and behavior-driven sustainability initiatives in the skincare industry. Practically, it provides insights for managers, brands, and educators on designing incentive-based, transparent, and user-friendly systems. Future research should conduct field trials, longitudinal studies, and cross-stakeholder collaboration to evaluate operational feasibility, financial viability, and long-term behavioral impact, extending the model's applicability to educational and community-based sustainability programs.

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