Proceedings of the 8th International Conference on Computing and Data Science
DOI: 10.54254/2755-2721/2026.36841

Service Journey-Based Design for Sustainable Consumption Behavior Guidance and Feedback Reinforcement

Enqi Lu

Division of Arts, Shenzhen University, Guangdong, China
yukeung.elsie@gmail.com

Abstract. The current study introduces a service journey-based design approach aimed at encouraging sustainable consumer choices in a digital environment of grocery shopping. A mobile shopping prototype named GreenCart Journey has been designed to provide pre-purchase guidance on sustainability, low-carbon purchase decision support, and post-checkout reinforcement feedback. The experiment took place during a four-week period among 120 university students including 60 people in the experimental group and 60 in the control group. The product database consisted of 180 grocery products distributed over six categories including information on price, packaging type, nutrition label, and carbon footprint. The research shows that by the end of Week 4 the ratio of low-carbon purchases of the experimental group is higher than that of the control group (0.64 ± 0.11 vs. 0.46 ± 0.13; $p < .001$). Furthermore, the average carbon score of the basket decreased by 18.72 ± 5.46 points, and sustainable substitution rate increased by 0.31 ± 0.08 ($p < .001$). These findings indicate that journey-based behavioral guidance and feedback reinforcement can transform sustainability information into repeated low-carbon purchase decisions.

Keywords: service journey, sustainable consumption, behavior guidance, feedback reinforcement, digital retail

1. Introduction

Sustainable consumption is a major concern in digital retail, yet environmental awareness does not always translate into low-carbon purchasing. Online grocery decisions are often shaped by price, familiarity, convenience, product images, and interface ranking, while sustainability information may be unclear or presented too late. Existing research shows that environmental labels can influence purchases, but their effectiveness depends on clarity, credibility, timing, and choice context [1].

Digital nudging can guide consumer decisions through ranking, defaults, prompts, and feedback without restricting choice [2]. However, isolated labels or warnings are often insufficient. Sustainability-oriented choice architecture is more effective when it provides convenient lower-impact alternatives [3]. Online grocery platforms increasingly use carbon labels, footprint tools, and decision-support features, while experimental interfaces provide suitable environments for testing such interventions [4, 5].

DOI: 10.54254/2755-2721/2026.36841

This study develops GreenCart Journey, a mobile shopping prototype that integrates sustainability guidance across the purchasing process. It combines pre-purchase goal setting, product comparison, lower-impact substitution prompts, and post-purchase feedback to test whether journey-based design increases low-impact product selection, sustainable substitution, and sustainable consumption intentions.

2. Literature review

2.1. Sustainable consumption behavior in digital retail

The definition of sustainable consumption behavior is the choice of those goods that meet individual needs but minimize the environmental load. The main factors shaping the sustainable consumption behavior in the digital grocery retailing are interface visibility, search convenience, ranking of products, trust in labeling, and option comparability. According to recent studies of environmental labeling and the willingness to pay, sustainability information helps consumers make food choices if they are clear and easy to interpret [6]. However, consumers ignore environmental information if it conflicts with price, discounts, and attractiveness of products.

2.2. Service journey design and behavioral guidance

The service journey design implies the consideration of the touchpoint sequence where users are becoming aware of their needs, compare different products, decide, buy, and reflect about the outcome of the decision. The major issue related to sustainable consumption in this case is to put behavioral guidance to the right decision point. Research on online grocery labeling shows that the provision of both nutrition and sustainability information enables consumers to make more informed decisions; however, the labeling system must be simple enough for fast shopping situations [7]. Thus, the service journey design should include not only awareness but also comparison, substitution, and reflection.

2.3. Feedback reinforcement and habit formation

The feedback reinforcement implies the coupling of the actions of consumers with the visible outcome. As far as low-carbon shopping is concerned, the influence of each individual basket is usually invisible and, thus, the motivation level of consumers decreases. Commitment and badge experiments show that soft rewards enable individuals to reduce the carbon footprints of their grocery baskets when they have visible behavioral targets and feedback [8]. Furthermore, the experimental studies on online supermarket positioning suggest that choice architecture is able to lower the environmental impact in case of making sustainable products more visible [9, 10].

3. Methodology

3.1. Research design and participants

The study adopts a four-week quasi-experimental design with 120 university students equally assigned to experimental and control groups. The experimental group uses GreenCart Journey, while the control group uses the same grocery prototype without sustainability features.

Each participant completes one weekly task, purchasing 10 products within a 150 RMB budget. Both groups receive the same products and spending limits, with weekly lists varied to reduce order

DOI: 10.54254/2755-2721/2026.36841

effects. Pre- and post-tests assess sustainability awareness, environmental concern, shopping knowledge, purchase intention, and post-experiment reflections.

3.2. Prototype design and service journey structure

GreenCart Journey includes three connected service phases. In the pre-purchase phase, users receive a weekly sustainability card before entering the product catalogue, showing a clear goal such as reducing the basket carbon score by 10 points. This introduces sustainability before product comparison.

During the in-purchase phase, each product displays carbon and packaging scores. The carbon score reflects estimated product emissions, while the packaging score represents packaging type. When users select a high-impact item, the system recommends a lower-impact alternative in the same category and a similar price range. The guidance score for product pp, user uu, and week tt is defined in Equation (1):

$$H_{u,p,t} = \sigma[\beta_0 + \beta_1(1 - \widetilde{C}_p) + \beta_2(1 - \widetilde{K}_p) + \beta_3 G_{u,t}^{goal} + \beta_4 R_{u,t-1}^{feedback} - \beta_5|\widetilde{P}_p - \widetilde{P}_b| + \beta_6 Sim(p,b)] \quad (1)$$

where $H_{u,p,t}$ represents the guidance suitability score, $\widetilde{C}_p$ is normalized carbon footprint, $\widetilde{K}_p$ is normalized packaging impact, $G_{u,t}^{\text{goal}}$ is the weekly goal activation state, $R_{u,t-1}^{\text{feedback}}$ is the previous feedback response, $\widetilde{P}_p$ and $\widetilde{P}_b$ are normalized prices of the candidate product and baseline product, and Sim (p, b) represents category and function similarity.

Figure 1 presents the internal service journey structure, including pre-purchase awareness activation, in-purchase decision support, and post-purchase feedback reinforcement.

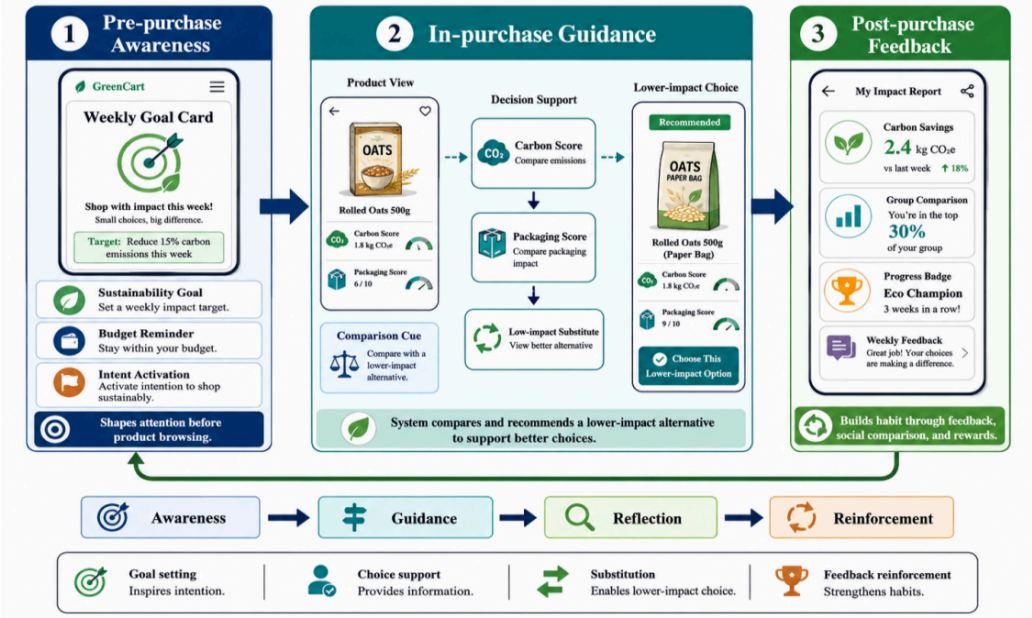

Figure 1. Internal logic of the GreenCart Journey prototype across pre-purchase, in-purchase, and post-purchase stages

DOI: 10.54254/2755-2721/2026.36841

During the post-purchase stage, users are provided with a feedback report containing the total carbon score of their basket, carbon saving compared to their previous basket, mean of experimental group, and badges achieved. This is aimed at making a single low-carbon choice a concrete form of achievement for users. Therefore, design integrates intention activation, decision-making support, and reinforcement in one service journey.

3.3. Data, tools, and measurement indicators

The product database contains 180 products belonging to six different groups: staples, vegetables, fruits, dairy, snacks, and beverages. Product information includes the name of the product, its price, image of the product, product category, type of packaging, and carbon footprint score. Interface and service journey are created using Figma tool, while React Native will be used to create the prototype of the app. Firebase will be used for logging of click path, number of views, number of substitutions, purchase, and task completion time. Behavioral data analysis will be done in SPSS 29, which will include the low-carbon purchasing ratio, average carbon score per basket, sustainable substitution ratio, frequency of viewing the feedback, and sustainable consumption intention in post-test stage.

4. Experimental procedure

4.1. Service journey mapping and prototype development

The research begins with a service journey map covering motivation, product search, comparison, decision-making, checkout, and post-purchase reflection. Three key pain points are identified: limited sustainability awareness before shopping, weak product comparison based on environmental impact, and lack of post-checkout feedback on basket-level consequences.

GreenCart Journey addresses these issues through weekly goal cards, carbon and packaging labels, lower-impact substitution prompts, checkout guidance, and weekly feedback reports. The control prototype uses the same layout, product database, search, cart, and checkout functions but excludes sustainability features. The service journey reinforcement index is calculated as shown in Equation (2):

$$J_{u,t} = \frac{\omega_1 V_{u,t}^{\text{goal}} + \omega_2 A_{u,t}^{\text{sub}} + \omega_3 O_{u,t}^{\text{carbon}} + \omega_4 F_{u,t}^{\text{report}} + \omega_5 B_{u,t}^{\text{badge}}}{\omega_1 + \omega_2 + \omega_3 + \omega_4 + \omega_5} \times \left[1 - \frac{\left|T_{u,t}^{\text{task}} - \overline{T}^{\text{task}}\right|}{\max(T^{\text{task}}) - \min(T^{\text{task}}) + \varepsilon}\right] \tag{2}$$

where $J_{u,t}$ is the journey reinforcement index, $V_{u,t}^{\text{goal}}$ is goal-card exposure, $A_{u,t}^{\text{sub}}$ is accepted substitute behavior, $O_{u,t}^{\text{carbon}}$ is carbon-label observation, $F_{u,t}^{\text{report}}$ is feedback-report opening, $B_{u,t}^{\text{badge}}$ is badge progress, and $T_{u,t}^{\text{task}}$ is task completion time. This formula captures both the behavioral engagement with sustainability features and the usability cost of the shopping process.

4.2. Four-week shopping experiment

In Week 1, participants complete the pre-test and first shopping task to establish baseline behavior. Weeks 2 and 3 involve additional tasks with different product requirements but the same 150 RMB budget, allowing analysis of changes in substitution and feedback use. In Week 4, participants complete the final task, post-test, and a short reflection. The experimental group receives all

DOI: 10.54254/2755-2721/2026.36841

GreenCart Journey features throughout the four weeks, while the control group uses the prototype without sustainability guidance. All participants are instructed to treat each task as a realistic weekly grocery purchase rather than a sustainability assessment.

4.3. Behavioral log analysis and feedback evaluation

Firebase records each participant's shopping behavior, with repeated reloads, invalid exits, and incomplete tasks removed during data cleaning. The final dataset includes selected products, categories, carbon scores, prices, substitution behavior, sustainability-information viewing time, and feedback-report access.

The main outcomes are low-carbon purchase proportion, basket carbon score, and sustainable substitution rate. Paired-samples tests compare pre- and post-test changes within groups, independent-samples tests compare post-intervention differences between groups, and repeated-measures analysis evaluates behavioral changes across the four-week period.

5. Experimental results

5.1. Changes in low-carbon product selection

The experimental group showed a stronger shift toward low-carbon grocery choices across the four weeks. In Week 1, the low-carbon purchase ratio was similar between the experimental group and the control group, 0.43 ± 0.12 versus 0.41 ± 0.13. By Week 4, the experimental group reached 0.64 ± 0.11, while the control group reached only 0.46 ± 0.13***. The average basket carbon score decreased by 18.72 ± 5.46 points in the experimental group, compared with 5.38 ± 4.91 points in the control group***.

5.2. Effect of journey-based guidance on sustainable substitution behavior

Journey-based guidance significantly increased sustainable substitution behavior. The experimental group accepted 2.84 ± 0.76 lower-impact substitutes per task in Week 4, while the control group had no comparable substitute function. Among experimental participants, the substitution acceptance rate increased from 0.26 ± 0.09 in Week 1 to 0.57 ± 0.12 in Week 4*** (see Table 1). The strongest substitution effects appeared in snacks, dairy, and beverages, where lower-carbon alternatives were easy to compare by price and packaging score.

Table 1. Sustainable substitution and feedback reinforcement outcomes

Indicator	Experimental group	Control group	Difference
Sustainable substitution rate	0.57 ± 0.12***	0.18 ± 0.07	+0.39 ± 0.09***
Accepted substitute count per task	2.84 ± 0.76***	0.91 ± 0.38	+1.93 ± 0.54***
Feedback report opening frequency	3.42 ± 0.69***	0.00 ± 0.00	+3.42 ± 0.69***
Journey reinforcement index	0.68 ± 0.10***	0.31 ± 0.08	+0.37 ± 0.09***
Repeated low-carbon choice intention	4.21 ± 0.44***	3.58 ± 0.51	+0.63 ± 0.18***

*Note: *** $p < 0.001$.*

DOI: 10.54254/2755-2721/2026.36841

5.3. Feedback reinforcement and repeated sustainable consumption intention

Feedback reinforcement was positively associated with repeated sustainable consumption intention. In the experimental group, feedback report opening frequency was correlated with Week 4 low-carbon purchase ratio, ($r = 0.46$, $p < 0.001$), and with post-test sustainable consumption intention, ($r = 0.52$, $p < 0.001$). Participants with higher journey reinforcement scores showed lower basket carbon scores, 49.86 ± 6.74, than participants with lower reinforcement scores, 57.42 ± 7.18**. These results suggest that sustainable behavior became more stable when guidance was distributed across the service journey rather than concentrated in a single label.

6. Conclusion

This study proposes and evaluates a service journey-based design model for sustainable consumption guidance in digital grocery shopping. By combining pre-purchase goal activation, in-purchase carbon and packaging guidance, sustainable substitute prompts, checkout reminders, and post-purchase feedback reports, GreenCart Journey translates environmental information into repeated shopping behavior. The four-week quasi-experiment shows that the experimental group achieved higher low-carbon purchase ratios, lower basket carbon scores, stronger sustainable substitution behavior, and higher repeated sustainable consumption intention than the control group. The findings suggest that sustainable consumption design should move beyond isolated labels and instead organize behavioral guidance across the full service journey. Future research can test the model with broader consumer groups, real retail platforms, and longer intervention periods.

References

[1] Potter, C., Bastounis, A., Hartmann-Boyce, J., Stewart, C., Frie, K., Tudor, K., Bianchi, F., Cartwright, E., Cook, B., Rayner, M., & Jebb, S. A. (2021). The effects of environmental sustainability labels on selection, purchase, and consumption of food and drink products: A systematic review. *Environment and Behavior, 53*(8), 891–925.

[2] Jesse, M., Jannach, D., & Gula, B. (2021). Digital nudging for online food choices. *Frontiers in Psychology, 12*, 729589.

[3] Meier, J., Andor, M. A., Doebbe, F. C., Haddaway, N. R., & Reisch, L. A. (2022). Review: Do green defaults reduce meat consumption? *Food Policy, 110*, 102298.

[4] Ytreberg, N. S., Alfnes, F., & van Oort, B. (2023). Mapping of the digital climate nudges in Nordic online grocery stores. *Sustainable Production and Consumption, 37*, 202–212.

[5] Braga, B. C., Cash, S. B., Sarson, K., Chang, R., Mosca, A., & Wilson, N. L. W. (2023). The creation of an online grocery store for experimental purposes: A pilot study. *Food Quality and Preference, 109*, 104888.

[6] Bastounis, A., Buckell, J., Hartmann-Boyce, J., Cook, B., King, S., Potter, C., Bianchi, F., Rayner, M., & Jebb, S. A. (2021). The impact of environmental sustainability labels on willingness-to-pay for foods: A systematic review and meta-analysis of discrete choice experiments. *Nutrients, 13*(8), 2677.

[7] Druschba, M., & Shakeri, G. (2023). Scale-Score: Food label to support nutritious and sustainable online grocery shopping. *arXiv* preprint arXiv:2309.03233.

[8] Panzone, L. A., Auch, N., & Zizzo, D. J. (2024). Nudging the food basket green: The effects of commitment and badges on the carbon footprint of food shopping. *Environmental and Resource Economics, 87*(1), 89–133.

[9] Jostock, C., Luick, M., Jebb, S. A., & Pechey, R. (2024). Changing the availability and positioning of more vs. less environmentally sustainable products: A randomised controlled trial in an online experimental supermarket. *Appetite, 200*, 107579.

[10] Lohmann, P. M., Gsottbauer, E., Farrington, J., Human, S., & Reisch, L. A. (2024). Choice architecture promotes sustainable choices in online food-delivery apps. *PNAS Nexus, 3*(10), pgae422.