Beyond the Wrapper: Uncovering the Effect of Explicit and Implicit Packaging Design Cues on Consumer Perception and Sustainable Disposal Behavior

Abstract

In pursuit of a more sustainable future, more and more firms are seeking alternative sustainable packaging and corresponding packaging communication strategies to signal its eco-friendliness and stimulate ecological consumer behavior. Despite the majority of research focusing on the pre-purchase stage of the packaging life cycle, limited attention has been given to enhancing post-consumption packaging disposal. This study examines the effect of both implicit (design strategy: imitation vs. differentiation), and explicit (packaging visualization and claims depicting the length of the supply chain: long vs. short) packaging design cues on sustainability perception and disposal behavior. Results from a laboratory study demonstrate that packaging following a differentiation strategy (vs. imitation) has a positive effect on both perceived sustainability and disposal behavior. Furthermore, the length of the supply chain, manipulated through on-packaging visualization and claims, significantly influences disposal behavior, with a significantly higher proportion of consumers correctly disposing of the packaging when the supply chain is depicted as short (vs. long). The findings contribute to environmental psychology and packaging design literature, providing valuable insights to designers, marketers, and policymakers in formulating effective and sustainable packaging interventions.

Research question and hypotheses

Research question: **How do explicit and implicit packaging design cues, as well as their interaction, affect consumer sustainability perception and disposal behavior of the packaging?**

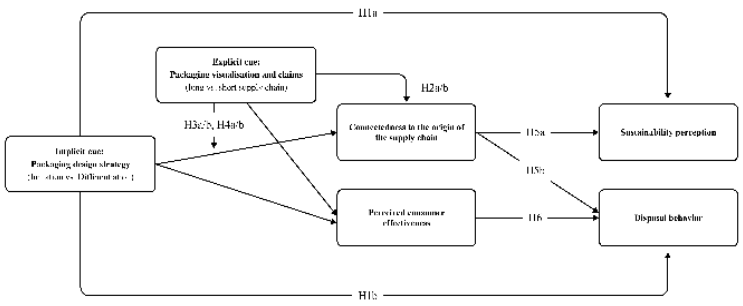

Figure 1: The research model

The hypotheses are formulated as follows (See Figure. 1 for the research model):
H1a: Packaging that follows a differentiation strategy be will be perceived as more sustainable than the packaging that follows an imitation strategy.
H1b: Packaging that follows a differentiation strategy will lead to more sustainable disposal behavior compared to packaging that follows an imitation strategy.

H2a: Packaging visualization and claims that depict a short supply chain will be perceived as more sustainable, compared to those that depict a long supply chain.
H2b: Packaging visualization and claims that depict a short supply chain will lead to more sustainable disposal behavior, compared to those that depict a long supply chain.

H3a: When packaging follows a differentiation strategy, consumers will perceive the packaging as more sustainable when a short supply chain is presented on packaging, compared to when a long supply chain is presented.
H3b: When packaging follows an imitation strategy, consumers will perceive the packaging as more sustainable when a long supply chain is presented on packaging, compared to when a short supply chain is presented.

H4a: When packaging follows a differentiation strategy, consumers will dispose of the packaging more sustainably when a short supply chain is presented on packaging, compared to when a long supply chain is presented.
H4b: When packaging follows an imitation strategy, consumers will dispose of the packaging more sustainably when a long supply chain is presented on packaging, compared to when a short supply chain is presented.

H5a: Feeling of connectedness to the origin of the supply chain will mediate the relationships between packaging design strategy, the length of the supply chain, and sustainability perception.
H5b: Feeling of connectedness to the origin of the supply chain will mediate the relationships between packaging design strategy, the length of the supply chain, and disposal behavior.

H6: The perceived consumer effectiveness will mediate the relationships between packaging design strategy, the length of the supply chain, and disposal behavior.

Method

A total of 275 participants from the TU Delft IDE faculty were recruited for the study. After excluding incomplete questionnaires, a final sample size of 252 participants (50.4% female, Mage = 22.39 years) was used for data analysis. The sample comprised a diverse mix of students, with 65.9% of participants being Dutch and 34.1% international students. The study was pre-registered, and participants were randomly assigned to one of four conditions in a 2 (packaging design strategy: imitation vs. differentiation) x 2 (packaging visualization and claims: long vs. short supply chain) between-subjects design.
The study took place in a computer room at TU Delft. Participants were invited to participate in a biscuit-tasting session to evaluate a new biscuit product and its packaging developed by a food company. Each participant was given a packaging tray, either following the imitation strategy (transparent tray) or the differentiation strategy (opaque white tray) with a biscuit inside. A paper demonstrating the length of the supply chain (long vs. short) was affixed to the desk (Figure. 2). Before starting, participants were required to read and agree to the informed consent incorparated in the Qualtrics questionnaire. They were then shown an image of the final packaging design for an overview of the entire product (Figure. 3) and proceeded to examine the packaging tray and read the information on the paper. Next, they were asked to eat the entire biscuit and evaluate its tastiness, naturalness, and healthiness. They can then share additional thoughts and feedback about the product. In the following section, participants were requested to re-evaluate the other part of the packaged product: the packaging itself. Participants were asked to interact with the tray again and answer a question about its appeal. Then they read the packaging information and responded to various questions related to packaging evaluation, including emotional responses, perceived sustainability, connectedness to the supply chain's origin, and perceived consumer effectiveness. A manipulation check was also conducted. In a subsequent section, participants answered questions regarding environmental concern, brand attitude, and purchase intention. Demographic information (gender, age, nationality, city of residence) was also collected. Participants were given the opportunity to share some last thoughts or comments. At the end of the study, participants were asked to leave their desks empty, ready for the next participants, and throw away the tray on their way out. A set of bin stations, comprising four bins (paper, organic, plastic, and general) arranged from left to right as prescribed by the bin producer, was placed at the left side of the exit to measure the disposal behavior of the packaging. Participants were not aware and informed of this measure.

Figure 2: Packaging visualization and claims: (Left) long supply cahin; (Right) short supply chain

Figure 3: Demonstration of the final packaging design in Qualtrics questionnaire (examples): (Left) imitation + long supply chain ; (right) differentiation + short supply chain

Results

The manipulation check confirmed a significant difference in the perceived number of steps in the packaging production process between the long (M=5.65) and (M=5.30) short supply chain conditions, indicating successful manipulation through packaging visualization and claim variations.

Effect of explicit and implicit cues on sustainability perception of the packaging (H1a, H2a, H3) (Figure. 4)**:** A two-way ANOVA was conducted to examine the effect of implicit and explicit cues on perceived packaging sustainability. Results demonstrated a significant main effect of design strategy ($F(1, 248) = 6.51$, $p = .01$, part. $\eta^2 = .03$), indicating that participants perceived the packaging following the differentiation strategy ($M = 5.21$, $SD = .11$) as more sustainable than those following the imitation strategy ($M = 4.80$, $SD = .11$). Therefore, H1a was supported. However, there was no significant main effect of the length of the supply chain or the interaction between the implicit and explicit packaging cues on sustainability perception. H2a and H3 were not supported.

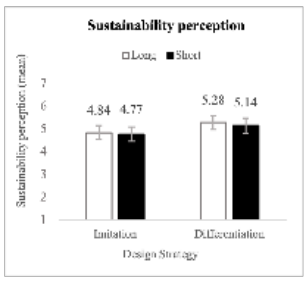

Figure 4: sustainability perception

Effect of explicit and implicit cues on disposal behavior (H1b, H2b, H4) (Figure. 5)**:** A logistic regression analysis was conducted, controlling for environmental concern and demographic variables (gender, age, and city of residence). The results showed a significant effect of design strategy on disposal behavior ($\chi2$ (1) = 5.34, $p < .001$), supporting H1b, indicating that a differentiation strategy promotes correct disposal practices compared to imitation. Additionally, the length of the supply chain had a significant effect on packaging disposal ($\chi2$ (1) = 4.33, $p = .04$), supporting H2b, revealing that a short supply chain displayed on the packaging stimulates more eco-conscious disposal actions compared to a long supply chain. However, no interaction effect was observed, leading to the rejection of H4.

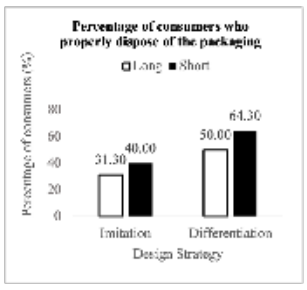

Figure 5: Correct disposal behavior

The mediating role of connectedness to the origin of the supply chain in the relationship between packaging cues and sustainable consumer responses (H5) (Figure. 6)**:** Moderated mediation regression analyses were conducted utilizing Hayes' PROCESS (Model 7) (Hayes, 2012). Design strategy was found to significantly influence connectedness to origin of the supply chain, which subsequently had a significant effect on sustainability perception, which partially supported H5a. However, no other mediating effects were identified in the analysis.

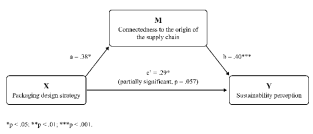

Figure 6: Identified mediation effect

The mediating role of perceived consumer effectiveness in the relationship between packaging cues and disposal behavior (H6): A moderated mediation analysis was conducted using Hayes' PROCESS macro (Model 7) in SPSS. Results suggested that perceived consumer effectiveness did not mediate the relationship between design strategy, length of the supply chain, and disposal behavior. Therefore, H6 was rejected.

Discussion

Theoretical implications
The study's findings contribute to environmental psychology, innovation, and packaging design by exploring the impact of explicit and implicit communication on sustainable responses, particularly in the post-consumption stage of packaging, indicating which cues effectively increase sustainability perception and disposal behavior.

- **Packaging design strategy:** The research contributes to the understanding of the role of packaging design strategies on sustainability perception and disposal behavior. It replicates previous findings on the positive effect of implicit packaging cues as sustainability reminders in enhancing perceived packaging sustainability. The study demonstrates that a differentiation strategy is more effective than an imitation strategy in promoting sustainability perception and driving sustainable disposal behavior.
- **Connectedness to the origin of the supply chain:** This study extends the concept of nature connectedness to sustainable packaging communication, focusing on connectedness to the origin of the packaging supply chain. It reveals the partial mediating role of connectedness to the packaging source in enhancing sustainability perception, emphasizing the effectiveness of a differentiation design strategy in fostering a sense of connection with the packaging material and production process.
- **Length of the supply chain:** The research introduces the concept of the length of the supply chain as an explicit cue to encourage sustainable disposal behavior, which proved to be effective. However, it does not significantly impact sustainability perception. This finding highlights the potential for explicit cues to influence disposal behavior in an unconscious, automatic, and intuitive manner, nudging behavioral tendencies without altering sustainability perception. This challenges traditional assumptions about sustainability communication, emphasizing the need to focus on behavioral aspects directly.

Practical implications
This research also presents practical insights for marketers, designers, and policymakers on strategically utilizing implicit and explicit packaging cues to effectively convey packaging sustainability to consumers and drive sustainable disposal behavior.

- **Differentiation strategy for ecological packaging design:** Government agencies and research labs can introduce new types of standardized packaging to replace the conventional plastic packaging following the differentiation strategy, facilitating correct consumer disposal behavior.
- **On-packaging communication for responsible disposal choices:** Packaging visual elements that depict a short supply chain can effectively encourage eco-friendly disposal. Companies can educate consumers about sustainable materials and packaging technologies through on-packaging information. In addition, the length of the supply chain has a lasting effect on guiding disposal behavior, even when cues are not present at the moment disposal. By disseminating information about the short supply chain through various channels, marketers and policymakers can increase consumer exposure and awareness, fostering widespread adoption of sustainable disposal.

TU Delft

Name Xi Chen, 5520436
Date 07-07-2023
Faculty of Industrial Design Engineering | Strategic Product Design

Supervisor Dr. ir. van den Hende, E.A.
Dr. Granato, G.