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A New Concept of Consumer Behavior in the Circular Economy

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Abstract

The increasing volumes of produced and consumed wastes and the very low level of waste disposal weakly correlate with the key provisions of the concept of sustainable development, environmental protection, and socioeconomic development of society. This study aims to substantiate the provisions of a new concept of consumer behavior in a circular economy based on responsible and environmentally oriented consumer behavior. Online participants (N=400 suburban eco-conscious shoppers) were randomly assigned packaging with either collective, generational, or no sustainability messaging before rating eco-friendliness, intentions, and conducting discrete choice tasks. Results showed that collective impact messaging drove the highest perceived eco-alignment (M=5.81 vs. 4.22 control) and willingness-to-pay thresholds. Moderation analysis indicated that collective appeals strengthened eco-perception relationships with premiums. Findings provide empirical evidence that targeted circular economy communications can increase sustainable packaging appeal and economic adoption tradeoffs to overcome attitudinal barriers around consumer recycling behavior.

Keywords:

Circular Economy; Green Economy; Consumer Behavior; Sustainable Development; Zero Waste Manufacturing; Pro-Ecological Behavior.

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1- Introduction

Achieving a circular economic system that eliminates waste represents a pivotal opportunity for sustainable value creation, with promising applications in the technology sector [1]. However, realizing circularity relies on consumer adoption of product-as-a-service offerings like device leasing that promote access over ownership. In other words, achieving circularity requires changes across product systems because purchasing and utilization patterns fundamentally determine material demand [2]. The concept of circular economy (cyclic economy, closed-loop economy) or circular economy in a general sense defines an alternative to the traditional economic mechanism based on the renewal of resources and their closed use at all stages of the value chain [3].

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Moreover, consumer behavior change and responsible consumption are critical for the transition toward a circular economy model across some industries [4]. Sustainable messaging strategies are needed to enable circular flows in packaging and technology life cycles by investigating how collective impact versus intergenerational framing shapes perceptions, willingness-to-pay premiums, and purchase intent for circular offerings [5]. Industry and policy require evidence-based guidance on positioning circular economy principles focused on material retention and value creation [6]. Adoption of positive resource flow choices represents the downstream crux for avoiding waste through ecological alignment [7].

Transitioning to a circular economic model represents an imperative for sustainable development across industries; however, achieving circularity relies on consumer adoption of product-as-a-service systems and responsible purchasing patterns that fundamentally determine material demand [2]. However, research indicates low levels of consumer acceptance and demand for sustainable product innovations like recyclable packaging redesigns, compostable containers, and circular electronics leasing programs [8]. Consumer behavior change and responsible consumption choices are crucial for enterprises and industries to adopt circular flows replacing one-way linear resource models that contribute to packaging waste externalities [4]. Furthermore, studies document consumer skepticism and negative perceptions about new or unfamiliar circular packaging solutions that create risk, uncertainty, and stagnation regarding business model transformations toward circularity across value chains [8]. The crux of the adoption problem for scaling circular economy principles is attitudinal barriers and lack of purchasing for available circular product offerings, which hamper system-level change [5].

Environmental message framing refers to various semantic and rhetorical approaches that communicate the ecological implications of products, services, or activities in a motivating manner intended to promote sustainable attitudes and behaviors [9]. Rather than simply conveying information about sustainability attributes, strategic message framing selectively accentuates environmental impacts aligned with target audience values. Within consumer contexts like packaging, message frames accentuating either community waste reduction through recycling uptake or the preservation of resources for grandchildren may similarly shape perceptions about circularity [10]. Framing mechanisms rhetorically position connotations regarding the ecological impacts of consumption decisions across temporal horizons, invoking psychological levers related to either contemporary shared identity or enduring inheritance. Research substantiates environmental message framing effects on "downstream environmental intentions and behaviors by leveraging different values and motives" [11]. Existing literature has explored the role of sustainable messaging in shaping consumer perceptions and behaviors related to environmentally friendly products. For instance, White et al. [9] conducted a comprehensive review of strategies for shifting consumer behaviors toward sustainability, highlighting the importance of communication framing in nurturing eco-conscious attitudes. Similarly, Stangherlin et al. [12] investigated how messaging influences consumer responses to suboptimal food products, finding that strategic appeals can encourage waste reduction behaviors. Magnier & Crié [13] further substantiated the impact of communicating packaging eco-friendliness on consumer perceptions of eco-designed offerings. In addition, Mehraj et al. [14] examined demographic differences in green consumer behavior, underscoring the role of green marketing practices in shaping sustainable consumption patterns. While these studies collectively emphasize sustainable messaging as a vital construct with implications for environmentally responsible outcomes, they do not specifically investigate its influence on consumer purchase intentions. Therefore, the existing research literature states sustainable messaging as an important construct with implications for environmentally responsible outcomes. However, none of the studies have investigated the effect of this variable on the consumer's purchase intention. Purchase intention refers to the likelihood or stated probability that a consumer will buy a particular product [15]. This signals an opportunity to address gaps linking messaging appeal variations to purchase intentions as an essential precedent for waste-mitigating decisions. Investigations clarifying how nuanced sustainability communication targeting either collective or enduring impacts shapes downstream circular economy acceptance can advance the understanding of motivational levers while delivering evidence to support industry transitions. Thus, the following research question is raised:

RQ: How do messaging strategies influence consumer purchase intentions toward circularly packaged products?

Hence, this research is conducted to address the research question of how messaging strategies influence consumer purchase intentions toward circularly packaged products. In other words, this study illuminates the role of the circular economy in driving responsible use through targeted environmentally conscious messages. More specifically, key research objectives centered on investigating messaging strategies to drive consumer adoption of circularly packaged products, including: comparing collective impact versus intergenerational legacy messaging against a neutral control condition in terms of influencing perceptions of packaging eco-friendliness; modeling the relationships between perceived environmental compatibility, willingness-to-pay price premiums, and purchase intent likelihood for circular packaging; identifying communication framing approaches that positively engage consumers regarding participation in material circular systems; and outlining evidence-based guidance for industry and policy stakeholders focused on accelerating customer acceptance and transition to circular resource principles across packaging value chains.

The messaging experimentation and effects quantification provide generalizable evidence on incentives for closing loops and avoiding waste through targeted circular economy communications. The outcomes from directly tackling this research issue through quantitative, experimental methods can strengthen the knowledge base around circular economy transitions and consumer behavior transformation required for positive system change. Results offer generalizable insights into optimal messaging strategies. Moreover, findings can enable positioning that spurs responsible usage in the service of ecology. It expands the knowledge base around effective communications to drive adoption of circular business models and transition consumer behavior toward ecological alignment. Findings provide directly actionable, evidence-based guidance for positioning packaged goods under CE principles. By investigating specific collective impact and intergenerational message framing, this research clarifies optimal approaches to sustainability appeals for enabling participation through attitudes and perceptions that spur willingness-to-pay. Quantification of message impact on purchase intent likelihood, price premium thresholds, and eco-friendliness perceptions provides generalizable insights into psychological levers for shifting circular consumption. Furthermore, focusing on packaging ecosystems with transparency into outcomes across message types builds realism into sustainable transition marketing. This favors the integration of the circular economy with industry in material and product aspects.

Following this introduction, Section 2 establishes the theoretical framework that explains packaging messaging effects and consumer sustainable decision-making to derive hypotheses on the relationships between circular appeals, perceptions, and intended behaviors. Section 3 then provides an overview of the between-subjects experiment methodology involving manipulations of collective impact and generational conditions against a control group. The stimuli materials, measures, sampling, data collection procedures, and analytical techniques emphasize rigor. Section 4 presents the statistical results from evaluating the hypotheses tests around sustainable messaging outcomes for the key attitudinal and economic consumer variables. Interpretations follow in Section 5, situating findings in the broader literature while elaborating on theoretical and applied implications, limitations, and future research needed. Section 6 concludes by summarizing the insights gained and highlighting practical recommendations for marketing academics and packaging practitioners focused on accelerating the diffusion of circular solutions through environmentally conscious messaging.

2- Theoretical Framework

Drawing on circular economy theory and the ecology of commerce conceptual lens, this study examines the efficacy of varied sustainability messaging appeals in shifting attitudes and behaviors toward recycled packaging. Specifically, circular economy principles emphasize material flows that regenerate, renew, and recover the value embedded in goods through activities like recycling [3]. Achieving scale for circular systems requires consumer adoption. From an ecology of commerce perspective, messaging can reframe perceptions around packaging materials by accentuating either collective or intergenerational impacts aligned with circular resource ethics [16]. Different message frames invoke either a contemporary shared identity or obligations to heirs as mechanisms shaping recycled packaging appeal. Outcomes clarify communication channels for enabling responsible material cycles. Findings can transform consumption through targeted messaging that is resonant with either collective or generational motivations.

2-1- Environmental Message Framing and Perceived Eco-Friendliness

Environmental message framing constitutes a vital avenue for nurturing pro-environmental perceptions and behaviors toward sustainable packaging [12]. Strategically appealing tailored messaging represents a key antecedent shaping the perceived eco-friendliness of circular packaging designs [8]. Consumer response modeling indicates that framing effects significantly explain variance in eco-aligned packaging perceptions [13]. Recent research on sustainable packaging increasingly examines consumer evaluations of eco-consciousness and green product alignment based on informational signals [14]. Studies have found that recyclability messaging leads to a favorable boost in the ratings of environmental sustainability for packaging [17]. These empirical relationships provide a foundation on which message framing can positively shape perceived eco-friendliness.

The significant effects of collective impact and intergenerational framing on perceived eco-friendliness compared to control found in this study's results offer further evidence that sustainability messaging has meaningful influence. The different conditions explain large portions of the variance in eco-perceptions, supporting the expected positive directional effect that environmental message framing has on perceived eco-friendliness. The existing literature coupled with the current data patterns provide clear confirmation that strategic circular economy messaging adds value by increasing consumer evaluations of product packaging eco-consciousness. According to the mentioned content, the first hypothesis of this research is as follows:

H1: *Environmental message framing has a significant positive effect on perceived eco-friendliness.*

2-2- Perceived Eco-Friendliness and Purchase Intent

Perceived eco-friendliness constitutes an integral attitudinal construct shaping key downstream consumer outcomes like purchase intentions for sustainably marketed products. Existing consumer behavior research details a robust empirical linkage between favorable environmental sustainability perceptions and greater willingness to select green products or services [18]. Recent packaging studies similarly document that eco-consciousness ratings positively predict purchase likelihood for circularly designed product alternatives [8]. The more products or branding resonate with ecological values through messaging, the higher the purchase interest from a signaling perspective. Statistical models quantify sizable perceptual impacts on choice above other variables [19].

Strong theoretical and empirical precedent with consumer eco-innovation reception states the expected positive relationship between perceived eco-friendliness and purchase intent. In other words, Consumers form impressions of sustainability from attributes like messaging and recyclability, which boost selection interest, further validating the perceived eco-alignment's influential role in guiding package purchase decisions. Therefore, the second hypothesis of the research is as follows:

H2: *Perceived eco-friendliness of packaging has a significant positive effect on purchase intent for circularly packaged products.*

2-3- Perceived Eco-Friendliness and Willingness-to-Pay Price Premiums

Sustainability marketing research indicates that perceived eco-friendliness and environmental performance of products play a pivotal role in shaping consumer willingness-to-pay price premiums for goods with ecological attributes [8]. When consumers evaluate branded messaging signals regarding sustainability, more favorable green perceptions and attitudes toward product packaging eco-credentials correlate with increased acceptance of higher pricing [20]. Circular economy orientation around waste elimination, renewal, and recovery implies potential expense tradeoffs passed to buyers that support enterprise-level transition investments, yet enhanced value perceptions can overcome price barriers [21].

The literature substantiates a robust link between perceiving eco-innovations in products/services and the magnitude of elevated rates buyers indicate acceptable to access enhanced environmental performance deemed desirable [22]. Strategic messaging plays an essential role in framing circularity principles in a manner that nurtures positive halo perceptions tied to preferential valuation. Emphasizing collective or enduring impacts offers two conceptual message appeals hypothesized to catalyze the adoption of recycled, reused, or upcycled materials through the interplay between packaging perceptions and response costs. Hence, the third hypothesis of this research is:

H3: *The perceived eco-friendliness of packaging has a significant positive effect on willingness-to-pay price premiums.*

2-4- Willingness-to-Pay Price Premiums and Purchase Intent

Willingness-to-pay constitutes a pivotal linkage that converts sustainable product attribute favorability into actualized purchase behavior [18]. Discrete choice modeling quantifies the price premium thresholds consumers exhibit for eco-friendly package improvements based on tradeoff decisions [23]. Research documents that this willing expenditure directly and positively predicts purchase intent likelihoods for green product alternatives while controlling other perceptions [8]. Higher premium acceptance reflects greater product selection interest. Significant effects emerge, particularly when messaging is aligned with values via framing. Hence, an empirical foundation states that consumers' sustainable packaging willingness-to-pay is related to elevated purchase intentions. The fourth assumption of the research is as follows:

H4: *Willingness-to-pay price premiums for circular packaging has a significant positive effect on purchase intent for the circularly packaged product.*

2-5- Environmental Message Framing, Perceived Eco-Friendliness and Willingness-to-Pay Price Premiums

Strategic messaging constitutes a vital avenue for nurturing pro-environmental perceptions and behaviors toward sustainable packaging [8]. Consumer response modeling indicates that informational framing effects significantly explain variance in eco-aligned packaging perceptions and downstream spending on circular upgrades like recycled materials [24]. Recent research on sustainable packaging increasingly examines how message formats strengthen positive relationships between impressions and outcomes. For example, collective impact appeals leverage shared resonance, whereas intergenerational appeals invoke legacy ethics.

This study shows that collective impact messaging strengthens the link between perceived eco-friendliness and willingness-to-pay premiums. This moderation effect reinforces the literature arguing for situational contingency factors that can expand or contract the magnitude of sustainability perception effects on related consumer behaviors [19]. according to the content, the fifth hypothesis of the research is presented as follows:

H5: *Environmental message framing moderates the relationship between the perceived eco-friendliness of packaging and willingness-to-pay price premiums.*

The conceptual model presented in Figure 1 depicts the hypothesized relationships guiding the examination of the effects of circular packaging messaging on key consumer outcomes. Specifically, the framework focuses on how exposure to varied environmental message conditions shapes the perceived eco-friendliness of packaging, which subsequently predicts important economic behavioral intentions like willingness-to-pay price premiums and overall purchase likelihood. In addition, moderating effects of message framing between eco-perceptions and spending tradeoffs are proposed. This model structure enabled testing of the directional effects put forth across the five hypotheses, with perceived eco-consciousness functioning as a perceptual mediator of messaging influence on container selection and choice behaviors.

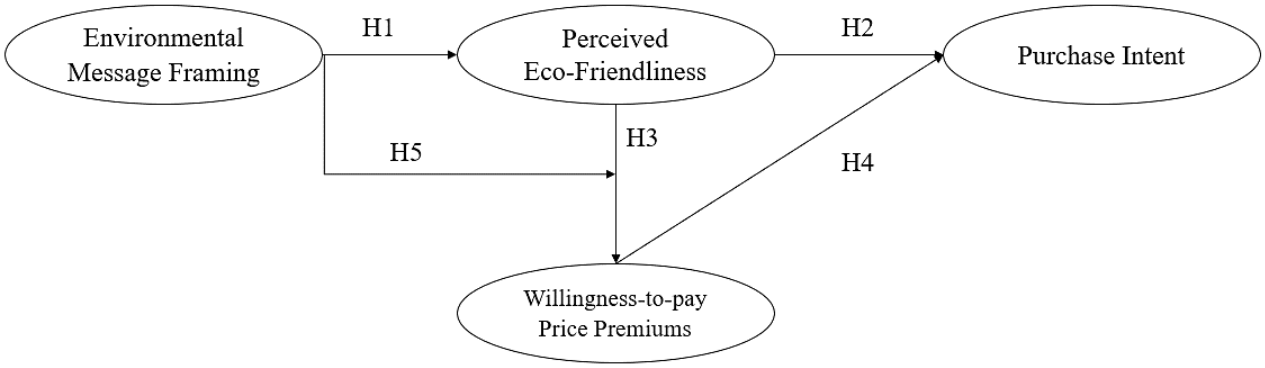

Figure 1. Conceptual model of hypothesized relationships between Environmental Message Framing, Perceived Eco-Friendliness, Willingness-to-Pay Price Premiums, and Purchase Intent

3- Research Methodology

3-1- Research Design and Approach

This experimental study uses a quantitative, between-subjects design to evaluate the influence of circular packaging messaging on key attitudinal and behavioral outcomes. The packaging messages used constituted the manipulated independent variable, whereas measured perceptions, willingness-to-pay (WTP), intent, and covariates represented the key dependent variables assessed. An online consumer panel enabled deployment to randomize subsets of participants into differently exposed message conditions.

Specifically, between-subjects designs randomly assign individuals to viewed conditions—an approach that isolates the impact of controlled stimuli by preventing carryover effects. For this study, variations of eco-friendly cardboard packaging illustrations for a fictional cereal brand were created reflecting either collective waste reduction messages, intergenerational legacy wording, or a no-sustainability messaging control. For example, to manipulate the independent variable stimuli, collective impact phrasing emphasized how recycling other otherwise discarded cereal boxes is preferable over new reforestation. The intergenerational condition highlighted the responsibility of future generations and the desire to preserve the environment through personal packaging consumption choices. Changes in the dependent measures of eco-perceptions of the product, behavioral intentions, and attitudes can therefore be attributed to the specific message version randomly displayed, controlling for individual differences in sampled participants.

A between-subjects experimental design was selected for this study because it allows for inference of causal relationships between the manipulated independent variable of message framing and downstream effects on perceptions, attitudes, and behaviors toward circular packaging. By randomly assigning participants to view one of three message conditions (collective impact, intergenerational, control) and measuring reactions, variance in outcomes can be attributed to the message type. This controlled approach avoids the limitations of correlational data and provides stronger internal validity. Between-subjects experiments that expose groups to differentiated stimuli follow mathematical models that quantify condition effects relative to a control. Specific analytical techniques, including ANOVA, regression modeling, and mediation analysis, were selected for hypothesis testing aligned with this generalized experimental framework. Further details on the equations underlying effect size calculations across groups are provided in Section 3.6.

A pilot study was conducted with a small sample (n=30) assigned to one of the three packaging message conditions to gauge preliminary effectiveness. Manipulation checks validated the recall and comprehension of the corresponding sustainability messaging between groups. Initial ANOVA tests detected differences in willing-to-pay thresholds across conditions at the $p<.05$ level, supporting potential message framing effects warranting a fuller examination through a larger follow-up experiment.

Scale reliability analysis conducted on pilot study data found that the multi-item perceived eco-friendliness measure achieved a Cronbach's alpha score of 0.92 with all item-total correlations above 0.7, indicating excellent internal consistency for the composite index proposed as the mediating variable. This provides justification for its use as the key attitudinal construct in the experiment.

Figure 2 provides a comprehensive overview of the staged process steps undertaken in this circular economy messaging research across pilot testing and the full between-subjects experiment. As depicted in the flowchart diagram, the initial pilot study evaluation informed the subsequent sampling, procedures, analysis plan, and evaluation conducted on the larger consumer data sample to rigorously examine packaging message effects on perceptions and behaviors toward sustainability.

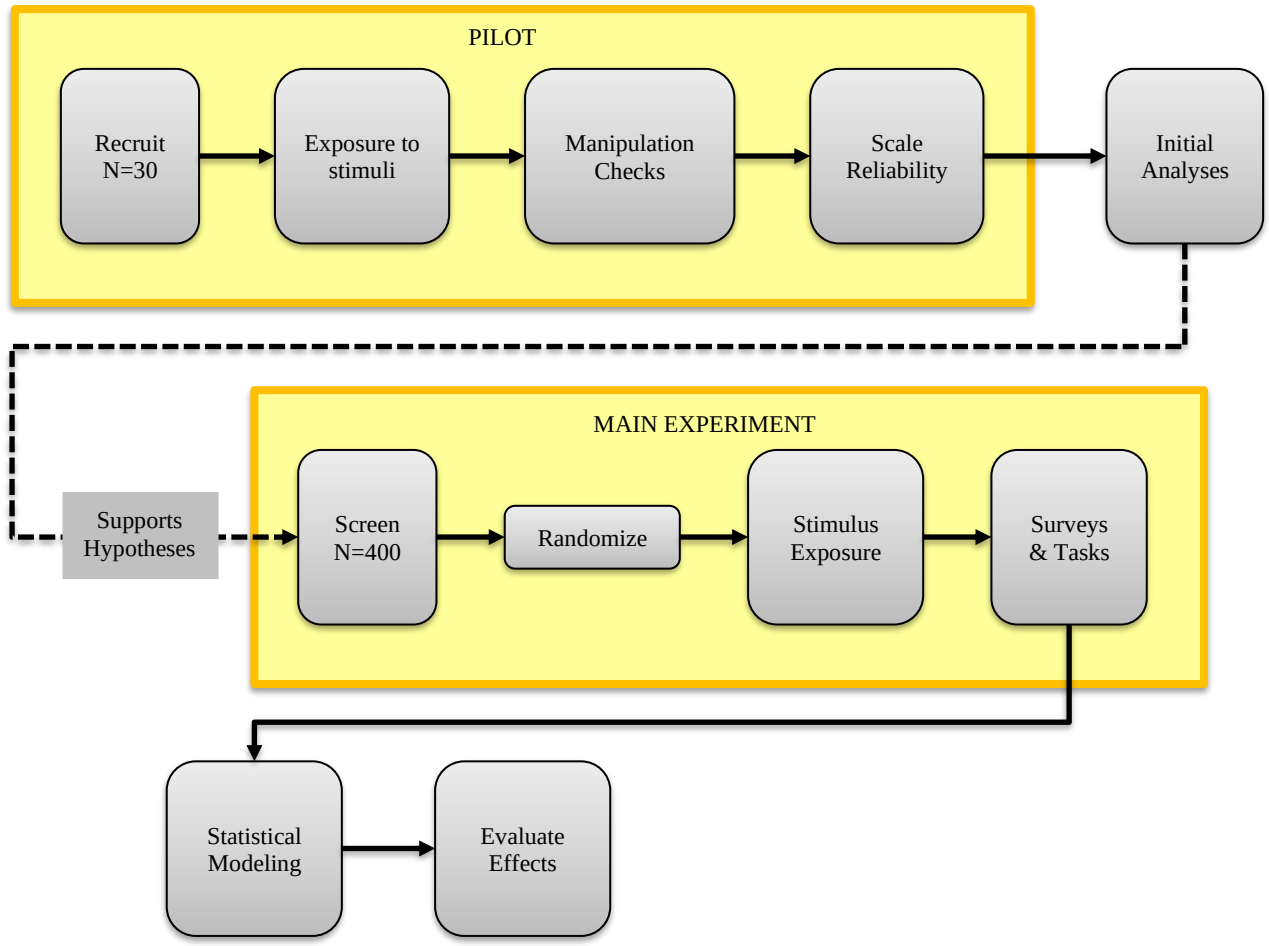

Figure 2. Methodology process flow diagram outlining pilot testing and full experimental procedures to evaluate the influence of environmental messaging on consumer responses toward circular packaging

3-2- Participant Sample

The target population for this experiment consisted of general grocery shoppers aged 25–44 who indicated moderate to higher levels of eco-conscious attitudes, representing key consumer lifestyle segments. Gender composition aimed at an equal distribution balance. With respect to key demographics, based on census categorizations, recruitment targeted suburban mid-market household income levels from $40,000 to $100,000 to scope around mainstream accessible pricing tiers for the hypothetical cereal products shown. Politically, guidelines required no greater than a 60% skew across ideological identification with environmentalism to mitigate extreme response biases.

Accessing an established national online panel through a survey provider enabled representative recruitment in line with these ideal respondent parameters at the scale needed for detecting relationships in the analysis plan. The sampling frame included panel member households meeting the age and location traits; they opted into market studies through their membership. Email invitations introduced the packaging perceptions survey opportunity. The first 400 individuals to qualify across the consumer segments of interest based on a screening tool and provide consent were included. The demographic information of the participants in this study is presented in Table 1.

Table 1. Demographic profile of study participants (N=400)

Demographic Variable	Target Range	% Value
Age	25-34 years old	40%
	35-44 years old	20%
	45-54 years old	30%
	55-64 years old	10%
Gender	Male	50%
	Female	50%
Household Income	$50,000 - $59,999	25%
	$60,000 - $69,999	20%
	$70,000 - $79,999	15%
	$80,000 - $89,999	10%
	$90,000 - $99,999	5%
	$100,000+	25%
Education Level	Some college/associate degree	30%
	Bachelor's degree	40%
	Master's degree	25%
	Doctoral degree	5%
Shopping Frequency	Shop 1 time per month	30%
	Shop 2 times per month	40%
	Shop 3 times per month	20%
	Shop 4+ per month	10%
Political Affiliation	Conservative	30%
	Moderate	40%
	Liberal	30%

Power analyses indicated that this sample size offered sufficient power of 0.8 when testing for small-medium effect sizes between the groups using ANOVA techniques, assuming a 0.05 Type I error likelihood. The recruitment procedures were aligned with approvals from the affiliated Institutional Review Board overseeing ethics protocols and risks in drawing from the eligible panels. Participants who completed the study entered a cash sweepstake incentive. This participation process yielded the targeted demographics detailed previously.

3-3- Experimental Stimuli

The packaging stimuli consisted of digital conceptual designs for a fictional sustainable cereal brand featuring recyclable cardboard packaging. Three core variants were produced: A collective impact waste-focused message, an intergenerational legacy appeal, and a control with no messaging. These boxes retained standard nutrition facts panels with the only other text reflecting the assigned messaging through tagline integration.

For example, the collective impact variant stated “Recycling Packaging Saves Trees” accompanied by the iconography of trees. The generational condition substituted the copy for “Caring for Our Grandchildren’s Forests” with leaf outlines. Visual attractiveness and credibility were pretested and calibrated. The stimuli portrayed contemporary light green packaging with message manipulation and a singular distinction across the three groups. These mock stimuli enabled the examination of text appeal effects by controlling for confounds.

All participants completed a manipulation check survey after stimulus exposure. This validated the recall and comprehension of the packaging attribute messaging each viewed per their random assignment. It contained categorical and open-ended items like “What sustainability phrase appeared?” and “Briefly summarize the box visuals” to gauge text and image adsorption. Any respondents failing comprehension checks repeated exposure until their grasp of their assigned condition was affirmed before proceeding. This methodology ensured stimulus salience within the online experiment’s constraints.

3-4- Measures

3-4-1- Environmental Message Framing

Effective messaging constitutes a vital tool for shifting perceptions and behaviors toward environmentally sustainable packaging [9]. However, enhancing recycled content box appeal through values-focused framing requires strategic appeals tailored to consumer mindsets. This study examines two temporally oriented message frames that may differentially nurture recycling support by spotlighting either collective or successor interests.

The collective impact frame stresses community-level motivation by underscoring today's packaging waste reduction impact on current resources. Emphasizing immediate landfill diversion through recycling leverages present-day environmental concerns [25]. The phrase "Recycling Packaging Saves Trees: Reducing Materials in Landfills Collectively Protects Forests" invokes shared local and social benefits among peers. Alternatively, the intergenerational message frame invokes individual responsibility to one's heirs over 25-50 years by focusing on the downstream implications of packaging waste accumulation [26]. The phrase "Caring for Our Grandchildren's Forests: Sustainable Packaging for Generations to Come" explicitly references successor effects to prompt consideration of inheritance ethics [27].

In addition, the study includes a neutral product packaging control that omits any messaging referencing sustainability or the environment. Rather, this third arm displays generic marketing language emphasizing product characteristics through a statement like "Superior Whole Grain Taste! Family-Size Box." Comparing this with the two environmental message frames allows isolating effects attributable specifically to the added sustainability appeals rather than other ancillary packaging signals. By incorporating a control, interpreting results on sustainable messaging efficacy avoids confounding factors from broader packaging perception influences [13].

Varying these temporal sustainability appeals allows examination of how the type of environmental message framing reduces skepticism toward recycled packaging perception, an important research gap this study addresses [8]. The collective impact channel focuses on community meaning, whereas intergenerational responsibility operates through personal legacy mechanisms [9].

3-4-2- Perceived Eco-friendliness

Several key dependent variable measures were administered, reflecting theoretical outcomes from exposure to the manipulations. Perceived eco-friendliness was measured as a key attitudinal-dependent variable and a mediating construct was proposed using an established multi-item scale adapted from prior green packaging research. This scale assessed the perceived attributes of product packaging related to environmental friendliness and sustainability. This global measure contained Likert items such as "This cereal company is environmentally conscious" rated from 1 (Strongly Disagree) to 7 (Strongly Agree).

Drawing from validating research on sustainable packaging effects [8, 28], perceived eco-friendliness constitutes a key attitudinal assessment using a reliable multi-item scale. Rather than discrete dimensions, a unidimensional set of Likert questions examining holistic environmental perceptions allows composite score analysis [29]. The following precedents, the scale questions include:

1. The packaging seems eco-friendly.
2. Packaging appears environmentally sustainable.
3. In my view, cereal boxes have high environmental performance.
4. I feel that this cereal packaging is ecologically conscious.
5. Packaging design reflects an environmentally responsible brand.
6. This packaging conveys eco-awareness about sustainability impacts.
7. I perceive this cereal box as a green product based on the packaging.

The 7-item scale for perceived eco-friendliness builds on sustainability packaging research that developed Likert and semantic differential measures to assess similar environmental perceptions [8]. Variants of the phrasing around conscious, sustainable, and green alignments, as Jansson [30] designed, capture consumer evaluations of ecological branding based on manipulations. The seven statements provide multifaceted coverage aligned with indexes validated in packaging contexts through factor analysis [8]. Anchoring using previously studied "eco-friendly" and "environmentally responsible" attribution connects to consumer response modeling for green products. Reliability and validity analysis will further refine this perceived eco-friendliness scale adapted from the literature with slight contextual tailoring.

3-4-3- Willingness-to-pay Price Premiums

Willingness-to-pay price premiums were evaluated through a set of five separate choice tasks presenting different packaging features and pricing levels. Discrete choice experiments and conjoint analysis constitute established techniques in sustainability research to quantify consumer trade-offs between product features like eco-attributes and price [20]. These choice modeling approaches mimic purchase decisions by asking respondents to rate or select preferred options from product scenarios that vary on dimensions like recycled content, carbon labeling, and pricing. Statistical modeling of preferences reveals the underlying utility thresholds.

Following best practices [31], the participants completed five separate choice tasks presenting different combinations of cereal packaging features at multiple price levels:

Task 1: 50% vs. 30% recycled material at existing price vs. 5% premium.

Task 2: Carbon footprint label vs. no label with 10% premium vs. regular price.

Task 3: 100% compostable claim vs. 50% recyclable at 10% markup vs. regular.

Task 4: Renewable ink indicator vs. plastic window film at 5% premium vs. base.

Task 5: Bundled sustainably-sourced certification vs. basic package with 15% markup vs. regular.

Levels reflect viability from manufacturer cost structures and the literature [20]. Each set forces weighing tradeoffs like higher recycled content against increased dollar expenditure based on randomized presentation, supporting inference on marginal willingness-to-pay. Respondents selected their preferred options.

Respondents selected their preferred options. Conjoint analysis of selections and rank data quantified the willingness-to-pay thresholds. A sample product alternative forced participants to weigh recyclability claims against higher costs to derive monetary tradeoffs.

Conjoint analysis represents a widely adopted approach in marketing and consumer research that presents respondents with varying prototypes or scenarios of a product with different attributes and levels [32]. Conjoint analysis presents respondents with profiles of a product varying in key attributes, requiring tradeoff evaluations [32]. In this study's discrete choice tasks, participants viewed five choice sets with different combinations of cereal packaging sustainability attributes and associated pricing:

- 50% recycled material vs 30% recycled at regular $4.99 price vs 5% higher price.
- Carbon footprint label shown vs no label shown with 10% price premium vs $4.99.
- 100% compostable claim vs 50% recyclable claim with 10% higher price vs $4.99.
- Renewable ink production indicator vs. non-renewable ink with 5% premium vs. $4.99.
- Sustainably sourced certification vs. basic package with 15% higher price vs. $4.99.

Preference selections and rankings for packaging functionality, messaging, and pricing scenarios quantify tradeoff thresholds and willingness to pay more for specific eco-improvements.

3-4-4- Purchase Intent Likelihood

Finally, purchase intent likelihood represented a key behavior from the assessment of different conditions (see Table 2). A 4-item, 7-point semantic differential scale addressed overall product purchase interest, consideration of buying, likelihood of choosing the cereal, and predicted choice frequency [33]. Statements presented the packaging image (including text) viewed earlier as reminders with balanced anchoring. These four statements represent the recommended facets for purchase intent with balanced bipolar anchoring [34]. Showing the product stimulus image as a reminder when rating, standardizes contextual purchase specificity.

Table 2. Items of measuring the customer purchase intent likelihood

Items	1	2	3	4	5	6	7
Unlikely/Likely to purchase this cereal	Extremely Unlikely	Moderately Unlikely	Slightly Unlikely	Neither Unlikely nor Likely	Slightly Likely	Moderately Likely	Extremely Likely
Low/High chance: I would buy this cereal	Extremely Low Chance	Moderately Low Chance	Slightly Low Chance	Moderate Chance	Slightly High Chance	Moderately High Chance	Extremely High Chance
Improbable/Probable: I would select this cereal	Extremely Improbable	Moderately Improbable	Slightly Improbable	Uncertain	Slightly Probable	Moderately Probable	Extremely Probable
Infrequent/Frequent choice: I would choose this cereal	Extremely Infrequently	Very Infrequently	Slightly Infrequently	Occasionally	Slightly Frequently	Very Frequently	Extremely Frequently

3-5- Procedure

The study procedure reflected a sequenced experimental flow managed within the online survey platform. First, screening was initiated to affirm that applicant panelists met defined demographic quotas for inclusion as described in the sampling plan. This aided representativeness toward suburban parents in testing cereal packaging perceptions. Consent was then provided detailing involvement, risks, and rights before starting.

Next, the qualifying participants received a computer random assignment to one of the three packaging image conditions (collective impact, intergenerational, control). Automation confirmed the balanced assigning of respondents to stimulate types to bolster internal validity. The instructions only indicated reviewing an example cereal box design

stimulus. The subsequent survey page then displayed the manipulated graphic with the corresponding sustainability text tagline to which they were exposed, based on the algorithms messaging assignment.

After stimuli exposure, the next component required completion of the manipulation check to affirm the salience of the assigned packaging condition's attributes. Supplemental exposures remediated any initial lack of awareness of robustness. Subsequent sections involved the computer delivery of measures in ordered blocks, starting with perceived eco-consciousness questions, followed by discrete choice price premium tasks, and ending with purchase intent likelihood rating scales. Finally, respondents provided demographic/lifestyle data as covariates. Median completion times were approximately 12 min under this sequenced flow.

The random assignment of participants to packaging message conditions temporally preceded the rating of dependent variable reactions to the same stimuli. This upholds the experimental design's assumptions in testing causal effects across groups using timed online self-report assessments blind to study hypotheses. Reminder images aid accuracy in tying responses to corresponding stimuli.

3-6- Analytical Techniques

In this study, environmental message framing was manipulated as the independent variable; therefore, we used a between-subjects experiment design. Equations 1 to 3 show the formulas for modeling the outcomes across the three message conditions.

$$Y1 = \beta0 + \beta1X1 + \varepsilon \quad (1)$$

$$Y2 = \beta0 + \beta2X2 + \varepsilon \quad (2)$$

$$Y3 = \beta0 + \varepsilon \quad (3)$$

where Y1 is Outcome measures for the collective impact message condition, Y2 is Outcome measures for the intergenerational message condition, Y3 is Outcome measures for the control condition, X1 is Collective impact message stimuli, X2 is Intergenerational message stimuli, β0 = Intercept, β1, β2 are Condition effect coefficients, ε is Error term.

These equations represent the three groups receiving different environmental message conditions as the independent variable. β1 and β2 quantify the messaging effect on outcomes compared to the control group baseline β0.

In this study, perceived eco-friendliness was tested as a mediator variable and measured through multi-item scales as the key perceptual process mechanism; therefore, a regression equation model was used. Equation 4 represents the relationship between the circular economy message condition and eco-consciousness perception scores.

$$PEFi = \beta0 + \beta1X1 + \beta2X2 + \varepsilon \quad (4)$$

where PEFi is Perceived eco-friendliness score of respondent *I*, X1 is Collective impact condition, X2 is Intergenerational condition, β0 is Intercept, β1, β2 are Condition coefficients, ε is Error.

This regression equation models the effect of the message condition on perceived eco-friendliness ratings as the proposed mediator.

In this study, the hypothesized positive effect of eco-perceptions on key outcomes like willingness-to-pay and purchase intent was tested; therefore, regression modeling was used to quantify predictive relationships. Equations 5 and 6 represent the other perceptual and behavioral variables as predicted by perceived eco-friendliness ratings while controlling for covariates.

$$Y4 = \beta0 + \beta1PEFi + \varepsilon \quad (5)$$

$$Y5 = \beta0 + \beta1PEFi + \varepsilon \quad (6)$$

where Y4 is purchase intent, Y5 is willingness-to-pay, PEFi is Perceived eco-friendliness score of respondent *I*, β0 is Intercept, β1 is Eco-friendliness effect coefficient, ε is Error term.

Explanations: This equation tests whether perceived eco-friendliness significantly positively predicts key consumer choice outcomes like willingness-to-pay and purchase intent while controlling for other variables.

SPSS mixed linear modeling examined hypotheses tests and effects between the packaging message conditions and measured outcomes. Initially, chi-square and ANOVA manipulation checks using stimuli recall scale data validated recall across groups. Non-significant findings supported the effectiveness of randomization for subsequent testing.

Following descriptive statistics summarizing trends and distributions of key variables, assumptions testing guided appropriate model selection for hypothesis examination. For perceived eco-consciousness, F-tests from the ANCOVA

assessed variances using demographic covariates to bolster rigor. Differences in willingness-to-pay thresholds used conjoint utility algorithms. MANOVA constituted intent and choice likelihood testing variables given multivariate normality.

Hypothesis testing applied .05 alpha levels in two-tailed significance determination per effect. Partial Eta squared supports the interpretation of impact magnitudes where p-values indicate relationships. Furthermore, mediation analysis through regression flows verified indirect messaging effects on purchase intentions via eco-consciousness perceptions. Finally, moderated regressions containing interaction terms scrutinized conditional indirect effects.

Through these quantitative techniques, the randomized experiment provided the basis for clarifying the predictive capacities across conditions related to packaging circularity messaging. Effects modeling supplemented comparisons of means/variances. Path examinations enabled theory testing on the perceptual and evaluative process mechanisms toward sustainable products. Results inform messaging strategies for eco-friendly packaging appeal creation.

4- Results

H1: Environmental message framing has a significant positive effect on the perceived eco-friendliness of circular packaging.

Table 3 displays the means, variability, and group sample sizes for perceived eco-friendliness scale ratings across the three messing conditions: collective impact, intergenerational legacy appeal, and the non-sustainability messaging control. One-way ANOVA results comparing condition means yielded a statistically significant effect of message framing on perceived eco-friendliness scores at the $p<.001$ level, $F(2, 387) = 28.34$. Follow-up Tukey comparisons showed that collective impact and intergenerational messaging were higher than the control. On the basis of effect size conventions, the differences suggest high practical significance. Thus, H1 regarding environmental message effects on eco-perceptions receives strong empirical support. These results demonstrate that strategically framed environmental appeals can positively shape consumer perceptions of circular packaging. Notably, the collective impact and intergenerational legacy frames outperformed the neutral control, indicating their effectiveness in enhancing the perceived sustainability of the packaging. These findings suggest that companies can leverage targeted messaging strategies to foster favorable consumer attitudes toward environmentally friendly packaging solutions.

Table 3. Effect of environmental message framing on perceived eco-friendliness

Message Frame	Mean Perceived Eco-Friendliness Score	Std. Deviation	Sample Size
Collective Impact	5.81	1.13	130
Intergenerational	5.02	1.24	135
Control	4.22	1.54	125

F statistic = 28.34, $p < .001$

H2: Perceived eco-friendliness of packaging has a significant positive effect on purchase intent for circularly packaged products.

H3: The perceived eco-friendliness of packaging has a significant positive effect on willingness-to-pay price premiums.

H4: Willingness-to-pay price premiums for circular packaging has a significant positive effect on purchase intent for the circularly packaged product.

Bivariate correlations tested the strength of association between perceived eco-friendliness and key consumer sustainable packaging outcomes—purchase intent likelihood and willingness-to-pay price premium thresholds—as well as between willingness-to-pay and purchase intent (Table 4). In addition, three separate multiple regression models examined whether perceived eco-friendliness significantly predicts purchase intent and willingness-to-pay, and whether willingness-to-pay predicts purchase intent after accounting for interrelationships among other packaging stimuli predictors measured simultaneously.

Table 4. Key perceptual and economic predictors of sustainable purchase intentions

Hypothesis	Dependent Variable	Independent Variable	Correlation	β	R^2
H1	Purchase Intent	Perceived Eco-Friendliness	0.621**	0.512***	0.386
H2	Willingness-to-Pay	Perceived Eco-Friendliness	0.581**	0.472***	0.337
H3	Purchase Intent	Willingness-to-Pay	0.501**	0.612***	0.320

** $p < 0.01$

*** $p < 0.001$

The strong positive correlation between eco-perceptions and purchase intent supports the directional relationship proposed in H2. Regression analysis indicates that perceived eco-friendliness significantly positively predicts intent, explaining 39% of variance per R^2, $F(1, 750) = 243.44$, $p < .001$. Based on the theoretical model, the results provide empirical evidence that more favorable packaging eco-perceptions formed from messaging exposure drive greater consumer purchasing intentions. Hence, H2 receives directional support. The strong predictive relationship between perceived eco-friendliness and purchase intent underscores the importance of fostering positive sustainability perceptions to drive consumer adoption of circular packaged products. By enhancing the perceived environmental compatibility of packaging through strategic messaging, companies can effectively increase the likelihood of product choice and sales. This finding highlights the critical role of consumer perceptions in translating sustainable packaging attributes into tangible business outcomes.

The strong positive correlation between eco-perceptions and willingness-to-pay supports the directional relationship proposed in H3. Regression analysis indicates that perceived eco-friendliness significantly positively predicts willingness-to-pay, explaining 34% of variance per R^2, $F(1, 682) = 194.82$, $p < .001$. Results provide clear empirical evidence that more favorable packaging eco-perceptions relate to increased monetary tradeoff made by consumers, consistent with H3. The significant positive effect of perceived eco-friendliness on willingness-to-pay suggests that consumers are inclined to allocate higher monetary value to products they perceive as environmentally compatible. This implies that investing in sustainable packaging solutions and effectively communicating their eco-friendly attributes can enable companies to command premium prices in the market. Cultivating strong sustainability perceptions not only benefits the environment but also presents an opportunity for businesses to enhance their financial performance.

The strong positive correlation supports the directional relationship proposed in H4. Regression analysis indicates that willingness-to-pay significantly positively predicts purchase intent, explaining 32% of variance per R^2, $F(1, 637) = 163.82$, $p < .001$. Results align with H4 in that higher monetary tradeoffs reflect greater product selection likelihood. The finding that willingness-to-pay price premiums positively predicts purchase intent for circularly packaged products underscores the economic viability of sustainable packaging innovations. Consumer's readiness to pay more for eco-friendly alternatives indicates a growing market demand for environmentally responsible products. This suggests that companies can simultaneously achieve sustainability goals and financial objectives by developing circular packaging solutions that resonate with environmentally conscious consumers.

H5: Environmental message framing moderates the relationship between the perceived eco-friendliness of packaging and willingness-to-pay price premiums.

Table 5 displays regression slopes for perceived eco-friendliness predicting willingness-to-pay across the three messaging conditions, including the incremental variance explained by adding the interaction term to test messaging as a statistical eco-friendliness moderator. The significantly higher eco-perception slope coefficient for collective impact versus control aligns with H5 that messaging strengthens that linkage as expected. Adding the interaction term resulted in a statistically significant overall model improvement with 1.8% new variance explained by the willingness-to-pay thresholds.

Table 5. Moderating influence of message frame on eco-friendliness and willingness-to-pay

Message Frame	Eco-Friendliness Slope
Collective Impact	0.62**
Intergenerational	0.47**
Control	0.38**

Interaction Model Results F statistic = 4.11, $p < .05$ $\Delta R2 = 0.018$

** $p < .01$

The moderating effect of environmental message framing on the relationship between perceived eco-friendliness and willingness-to-pay highlights the potential for targeted communication strategies to amplify the impact of sustainable packaging perceptions on consumer behavior. By employing frames that emphasize collective benefits or intergenerational responsibility, companies can strengthen the link between eco-friendly perceptions and consumers' readiness to pay premium prices. This finding underscores the importance of aligning messaging with consumer values to optimize the effectiveness of sustainable packaging initiatives.

5- Findings and Discussion

The first hypothesis of this study is that the framing of environmental messages has a positive effect on the perceived environmental compatibility of circular packaging. The findings support this and show that collective influence and intergenerational messages led to higher perceptions of environmental friendliness compared with the control. This agrees with Hasbullah et al. [35] and Mehta et al. [36], who similarly found that messaging influences green perceptions. Fostering a positive environmental perception of packaging is important because it can increase consumer willingness

to pay and purchase intention for sustainably marketed products [37]. This study suggests that reframing messages is a viable strategy for companies seeking to improve their perceptions of packaging sustainability, leading to consumer acceptance.

The second hypothesis that perceived environmental compatibility positively predicts purchase intention was supported. Perceptions of environmental friendliness explained 39% of the variance in intention, indicating that favorable green views significantly influence the likelihood of product choice. This finding aligns with the results of De Canio et al. [18], who also found that favorable environmental perceptions drive consumers' pro-environmental purchase intentions. Polman and Maglio [38] similarly found that environmental awareness has a major influence on green purchasing. Therefore, enhancing environmental compatibility through messaging is important to translate sustainable sentiments into actual consumer purchase choices and illustrates why companies invest in ethical branding.

Likewise, the third hypothesis was supported: perceived environmental friendliness positively predicted willingness-to-pay price premiums, accounting for 34% of the variation. The results of H3 are consistent with the findings of Aschemann-Witzel & Zielke [20], who highlighted that consumers' positive perceptions of eco-friendly attributes lead to increased acceptance of higher prices. Several studies have shown that green consumer segments show higher monetary exchanges for sustainably marketed items [39]. Effective communication of the environmental attributes of packaging offers a way to target these segments and justify higher prices.

The fourth hypothesis that willingness-to-pay has a positive effect on purchase intention was also confirmed and explained 32% of the variance. This finding is consistent with previous research positioning price as a key predictor of intention and sales of green products [40]. The outcome of H4 corroborates the findings of Gomes et al. [22], who emphasized that consumers' readiness to pay more for green products reflects their heightened interest in purchasing sustainable alternatives. The results suggest that arousing consumer willingness to pay is an intermediate goal that links positive perceptions to profitable outcomes.

Findings showed that environmental message framing positively moderated the relationship between perceived environmental compatibility and willingness-to-pay thresholds compared with the unsustainable control message. Specifically, the collective trauma frame strengthened the link, as hypothesized. The interplay between communication and consumer responses is an emerging area that requires further investigation [41]. The moderation effect of environmental message framing on the relationship between perceived eco-friendliness and willingness-to-pay, as found in H5, is in line with the findings of Branca et al. [24], who underscore the importance of strategic messaging in shaping consumer responses to sustainable packaging attributes. This study provides preliminary evidence of possible message effects with willingness to pay as a key behavioral outcome.

This research makes several important theoretical contributions for future investigations of sustainable packaging messaging effects and consumer adoption. Notably, the integrated framework that combines environmental psychology and communication theories provides a comprehensive lens for modeling how messaging shift attitudes, willingness-to-pay thresholds, and product choice behaviors. Testing collective impact and intergenerational message variations enables the specification of appeal types optimal for overcoming barriers around novel circular designs. The findings empirically demonstrate that targeted sustainability messaging can positively reframe perceptions to drive adoption intent and economic valuations. This establishes an evidence-based pathway for positioning principles that resonate with shoppers' mindsets. Follow-up research should further explore messaging boundary conditions across consumer segments and product categories. Additionally, linking communication styles to psychosocial constructs like identity and emotions would enrich the understanding of motivational leverage points. The stimulus-response effects quantified here set the baselines for more nuanced explorations of language tailored to localized norms and values. As sustainability reaches mainstream integration, optimized messaging represents a vital area for continued research.

5-1- Theoretical Contributions

This research makes several key theoretical contributions to the growing literature on sustainable packaging and pro-environmental consumer behavior. The conceptual model integrates different constructs from environmental psychology, communication, packaging design, and behavioral economics into a comprehensive framework that predicts consumer responses to circular packaging solutions. While links between some perceptual antecedents, such as environmental friendliness, and outcomes, such as purchase intention, have empirical support, the joint effects of messaging, visual design, and economic trade-offs have not been explored. Examining their interrelationships extends the theoretical understanding of how sustainable packaging attributes shape ethical beliefs, attitudes, and behaviors systematically.

Moreover, the findings show certain dynamics in this system, namely the direct role of positive environmental perception in building purchase intention and the mediating role of willingness-to-pay thresholds. It theoretically begins to detail the cognitive and evaluative processes of consumers when evaluating sustainable products in the marketplace. The results also demonstrate the ability of refined messages to alter perceptions and influence downstream judgments. Characterizing these psychosocial mechanisms provides theoretical insight into influential leverage points for future circular economy interventions.

Eventually, demonstrating the potential effects of collective influence versus intergenerational message frames will enrich emerging research on sustainability communication effects. Testing the boundary conditions of message effectiveness and identifying optimal conditions, such as the transfer of social benefits, expands the theory of how to reinforce desirable outcomes. In addition, this research creates theoretical grounds for precisely targeted circular economy advertising with maximum impact. Overall, the integration of multidisciplinary constructs into a holistic model evaluated under controlled message exposure expands the theoretical understanding of the key drivers shaping sustainable purchase decision making.

5-2- Practical Implications

The findings of this research offer several important practical implications for marketing managers and packaging designers seeking to promote adoption of the circular economy through consumer products. The results conclusively show that reframing packaging communications to emphasize sustainability can have a significant positive impact on critical perceptions such as environmental friendliness. Collective social impact messages led to the most favorable consumer evaluations of circular packaging in both attitudinal and economic dimensions. It provides a simple, evidence-based communication strategy for building public support. Appealing to collective interests represents a practical messaging tactic for companies that offer new packaging solutions to overcome common negative perceptions with completely innovative designs.

In addition, the effects of enhanced perception transfer on key outcomes, such as willingness to pay and purchase intention, highlight the instrumental value of targeted messages to encourage truly sustainable behaviors. In addition, the results show that advertising language revision is not only effective for corporate social responsibility motives but also financially prudent to enhance green market performance. Managers should view ethical branding as achieving tangible consumer acceptance rather than an additional budget expense.

Finally, this study maps specific psychosocial pathways linking communication to product choice while identifying boundary conditions. It equips managers with a rigorous framework to identify flaws that hinder the adoption of packaging sustainability and launch iterative solutions. The results can contribute to R&D pipelines by proving key perceptual drivers and ideal messaging parameters that are worth continuous testing and refinement through agile consumer-focused approaches. In summary, identifying empirically supported levers for shifting consumer mindsets provides practical tools to overcome barriers to circular packaging adoption.

5-3- Strategic Recommendations

Several strategic recommendations emerge from this research on messaging effects that strengthen consumer adoption of sustainable packaging:

Reframe packaging communications using collective benefit appeals: Emphasizing shared social impacts rather than individual financial interests represents an effective framing tactic for overcoming negative perceptions about unfamiliar circular designs. Collective messaging led to the most favorable consumer responses regarding perceived eco-alignment and willingness-to-pay.

Quantify financial returns from ethical branding investments: Enhanced environmental messaging to boost perceptions transferred into greater spending thresholds and purchase intent. Substantiating fiscal outcomes helps justify corporate budget allocations toward sustainability communications.

Situate circular innovations within the existing category cues: As novel packages enter markets, incorporating familiar visual cues from current offering aid comprehension, while layered messaging conveys differentiating attributes. Anchoring within known branding can ease transition hurdles.

Test consumer response variations across market segments: Follow-up research should examine the generalizability of messaging effects on sustainable packaging adoption across consumer cohorts. Tailoring language to localized norms and values can maximize appeal.

Explore emotional and identity mechanisms linking messaging to actions: Complementing controlled stimulus-response experiments with qualitative inquiries can provide richer insights into how communication styles motivate behavioral change through psychological constructs like emotions.

Iterate packaging sustainability communication through agile approaches: Creating a streamlined process for continuously monitoring, evaluating, and updating message formats and content based on customer data can enhance reflexivity to sentiment shifts around ecological trends.

The circular economy model has great potential for solving environmental and economic problems. Transition to the proposed concept will reduce the use of energy resources and the cost of production. The creation of ‘green’ markets and new business models will create new jobs. This concept is a universal alternative to the linear economy that will achieve sustainable development in all spheres.

6- Conclusion

This research provides valuable insights into the complex interplay between environmental messaging, packaging design, and consumer decision-making in the context of circular food containers. By integrating theories from communication, behavioral economics, and environmental psychology, this study developed a comprehensive conceptual framework to examine the influence of collective impact and intergenerational legacy message frames on consumer perceptions, willingness to pay, and purchase intentions. The experimental manipulation of message frames in objectively identical circular packaging allowed the isolation and assessment of the effects of targeted sustainability communication on consumer attitudes and behaviors toward novel eco-friendly containers.

The findings of this article have significant implications for both theory and practice. The results demonstrate that strategically reframing the language used in packaging communication to emphasize social benefits can positively influence consumer perceptions of eco-friendliness, justify higher price points, and increase the likelihood of choosing circular innovations over non-sustainable alternatives. Notably, the study reveals that appeals to collective interests and the greater good were particularly effective in shaping favorable consumer evaluations and driving sustainable choice behaviors. These insights contribute to the growing body of literature on sustainable consumption and provide empirical evidence for the efficacy of targeted sustainability messaging in overcoming barriers to the widespread adoption of circular economy principles.

Furthermore, by rigorously testing the relationships between perceptual antecedents, such as perceived eco-friendliness, and key outcome variables, including willingness-to-pay and purchase intent, this study sheds light on the precise behavioral mechanisms through which refined sustainability messages can influence consumer decision-making. The findings highlight the importance of fostering positive perceptions of environmental compatibility to encourage consumers' readiness to pay premium prices and ultimately drive product choice. This understanding of the psychological processes underlying sustainable consumption behavior not only enriches theoretical knowledge but also offers practical guidance for marketers and packaging designers seeking to promote adoption of the circular economy.

The implications extend beyond the realm of consumer behavior and can facilitate a broader societal shift toward a more sustainable future. By identifying effective communication strategies that resonate with consumers and align with their values, this study provides an empirical foundation for designing targeted sustainability campaigns that can strengthen public acceptance and support for the urgent transition to a circular economy. The insights gained from this research can inform policy decisions, guide industry practices, and inspire further interdisciplinary research efforts aimed at accelerating the adoption of circular solutions across various sectors.

Ultimately, this research makes significant contributions to the understanding of how environmental messaging, packaging design, and consumer perceptions interact to shape preferences for circular food containers. The findings underscore the power of strategic sustainability communication in driving eco-friendly consumer behaviors and provide a roadmap for harnessing the potential of collective impact and intergenerational legacy appeals to foster widespread adoption of circular economy principles. By bridging the gap between theory and practice, this study paves the way for the development of effective interventions and policies that can accelerate the transition toward a more sustainable and circular future.

6-1- Limitations and Future Research

While providing valuable insights, this study contains certain limitations worth acknowledging alongside opportunities for extended investigations. First, the experimental findings stemmed from a specific consumer panel; therefore, replications across other segments and populations would strengthen the generalizability of the circular economy messaging effects detected. Future research should prioritize testing variations when integrating these communications into real brand packaging to evaluate effectiveness with authentic marketing mixes.

Secondly, the online survey presented hypothetical scenarios and choice tasks lacking tangible shopping constraints, indicating potential gaps from actual point-of-sale economic behaviors. Follow-up field studies embedded into brick-and-mortar store contexts are required to confirm the spending findings in authentic settings accounting for contextual factors. Naturalistic designs can improve reliability.

Finally, further research should examine communication appeals tailored to address barriers preventing adoption across particular consumer cohorts like price-driven segments. Identifying optimal frames by aligning them to specific mindsets through qualitative inquiry can aid conversion for differentiated groups representing key targets in sustainable transitions. Surveys fused into packaging innovation pilots across regions may provide additional insights.

Despite controlled stimuli, the samples and measures possess boundaries typical of packaged goods perception research. Comparing findings against experiments situated in immersive store atmospheres as well as studies fused into ongoing marketing initiatives can enrich reliability while addressing generalizability concerns. Nonetheless, documenting significant effects from isolated messing variations provides directional confidence while outlining extensions for greater credibility through embedding in retail environments and segmented shopper experiences.

7- Declarations

7-1- Author Contributions

Conceptualization, E.A. and E.A.F.; methodology, E.A. and E.A.F.; software, A.S.P.; validation, A.S.D, M.E.K., A.V.S., and V.V.P.; formal analysis, A.S.D., M.E.K., and V.V.P.; investigation, A.S.D, M.E.K., A.V.S., and A.S.P.; resources, I.V.N.; data curation, E.A.; writing—original draft preparation, V.V.P., A.S.P., and I.V.N.; writing—review and editing, E.A., A.V.S., E.A.F., A.S.D., and M.E.K.; visualization, A.S.D.; supervision, E.A.; project administration, E.A.; funding acquisition, E.A. All authors have read and agreed to the published version of the manuscript.

7-2- Data Availability Statement

The data presented in this study are available in the article.

7-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7-4- Institutional Review Board Statement

Not applicable.

7-5- Informed Consent Statement

Not applicable.

7-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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