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Sustainable Packaging in the Beverage Industry: A Conjoint Analysis of Gen Z College Students' Preferences in Davao City

Niel Kevin Longyapon[1]*, Lianne Guinevere Sapidan[2], Maxine Christiana Sy[3]
Ateneo de Davao University, Philippines
Corresponding Author: Niel Kevin Longyapon nkblongyapon@addu.edu.ph

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A B S T R A C T

This study examined Generation Z college students' preferences for sustainable packaging in Davao City's beverage industry amid rising environmental concerns. Conjoint analysis was employed to evaluate packaging attributes including material type, brand transparency, ease of recycling, and environmental and social practices, based on data from 300 Gen Z students across multiple universities. Multi-Attribute Utility Theory and Means-End Chain Theory guided the analysis. Results revealed a strong preference for eco-friendly materials and transparent brand practices, with brand transparency accounting for 30.8 percent importance. Students favored biodegradable or recycled packaging and clear sustainability messaging, while ease of recycling was also significant. These findings suggest beverage businesses should prioritize transparency and eco-friendly packaging to meet Generation Z's sustainability expectations.

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INTRODUCTION

Generation Z (Gen Z), defined as individuals born between the mid-1990s and early 2000s, constitutes an increasingly influential consumer group characterized by their high digital literacy and environmental consciousness. Within the beverage industry, this cohort demonstrates a strong preference for ready-to-consume drinks such as coffee, smoothies, and bottled beverages. These choices are influenced not only by convenience but also by the alignment of products with their sustainability values (Dave, 2023). Concurrently, the escalating environmental challenges related to plastic waste and resource depletion have heightened the urgency for sustainable packaging solutions, particularly given the beverage sector's heavy reliance on single-use plastics known to exacerbate pollution (Dobson, 2024).

The business-to-consumer (B2C) segment, encompassing coffee shops and on-the-go drink establishments, represents a critical area for investigating sustainable packaging preferences. These venues attract significant patronage from Gen Z consumers, who prioritize ease of access and social engagement while exhibiting increasing concern about the environmental impact of their consumption choices (Neu, 2021). This generation demonstrates skepticism toward superficial corporate sustainability claims or "greenwashing," favoring brands that demonstrate genuine transparency and commitment through eco-friendly packaging, sustainable sourcing, and socially responsible practices (Shaw, 2024).

Despite the prominence of sustainability in global consumer discourse, there remains a paucity of research focusing on the packaging preferences of Gen Z within Southeast Asia, particularly the Philippines. Much of the extant literature concentrates on broader demographics or Western markets, thus neglecting the cultural and contextual nuances shaping consumer behavior in emerging economies. Moreover, there exists a methodological gap regarding the application of sophisticated preference elicitation techniques such as conjoint analysis with the PAPRIKA method. This approach enables the identification of trade-offs consumers make among multiple product attributes, thereby providing a more granular understanding of decision-making processes (Wang et al., 2022).

Several studies in related fields illustrate the relevance of conjoint analysis in elucidating Gen Z preferences within the Philippine context. Sumatra et al. (2025) utilized conjoint analysis to examine sustainable tourism preferences among Gen Z in Southeastern Mindanao, revealing that eco-conscious experiences and affordability are principal factors in travel decisions. Similarly, Sumatra (2025) applied the PAPRIKA method to assess preferences for features of online learning platforms, identifying flexibility and accessibility as primary attributes valued by Gen Z learners. These studies demonstrate the efficacy of conjoint analysis in capturing complex preference structures but also highlight the scarcity of similar investigations into sustainable packaging preferences in the beverage industry.

Davao City offers a distinctive context for this inquiry due to its diverse university population and progressive environmental policies, including the

implementation of single-use plastic bans across multiple campuses (Medina et al., 2024; SunStar, 2019). These regulatory measures underscore the local commitment to sustainability and present an opportunity to explore how policy environments intersect with consumer preferences and business practices. However, empirical data remain limited regarding Gen Z students' sustainable packaging preferences in this locale, including their valuation of material types, brand transparency, ease of recycling, and corporate environmental and social initiatives.

Addressing this gap has significant implications for both industry and policy. Beverage businesses that adapt packaging strategies to align with Gen Z's preferences can enhance customer loyalty and contribute to environmental stewardship. Concurrently, policymakers may utilize such insights to refine regulations and educational programs aimed at fostering sustainable consumption patterns.

Therefore, the present study seeks to contribute to the literature by examining the sustainable packaging preferences of Generation Z college students in Davao City through the application of conjoint analysis utilizing the PAPRIKA method. This approach facilitates a detailed understanding of the attribute trade-offs made by consumers, offering novel insights relevant to both academic discourse and practical implementation in the Philippine beverage industry. By focusing on a culturally specific and policy-relevant setting, the research aims to advance knowledge on consumer-driven sustainability and support evidence-based decision-making for businesses and regulators alike.

LITERATURE REVIEW

This study is anchored on three theories that collectively guide the understanding of Generation Z students' preferences for sustainable beverage packaging: Multi-Attribute Utility Theory (MAUT), Means-End Chain Theory (MEC), and the Technology Acceptance Model (TAM). Each theory contributes a unique perspective—MAUT focuses on preference ranking and decision-making based on multiple attributes, MEC links product attributes to consumers' values and motivations, and TAM explains the cognitive processes behind product acceptance and usage. Together, these theories provide a comprehensive framework for analyzing the factors influencing Gen Z's sustainable packaging choices.

Multi-Attribute Utility Theory (MAUT)

Multi-Attribute Utility Theory (MAUT), originally developed by Fishburn (1965) and refined by Raiffa and Keeney (1969), is a decision-making framework that ranks and evaluates alternatives based on multiple attributes. The theory quantifies the utility or satisfaction that decision-makers derive from various combinations of attribute levels. In this research, MAUT is applied to identify and measure the preferences of Generation Z students regarding key sustainable packaging attributes, including material type, brand transparency, ease of recycling, and environmental and social practices. This theory is central to the study's methodology, allowing a systematic assessment of which attribute combinations maximize utility for the respondents.

Means-End Chain Theory (MEC)

Means-End Chain Theory (MEC), developed by Olson and Reynolds (1983), explains how consumers link product attributes to personal values through perceived consequences. The theory proposes a hierarchical structure connecting attributes (product features), consequences (functional and psychological outcomes), and values (core personal beliefs). MEC offers insight into why certain sustainable packaging attributes resonate with Generation Z by revealing how these features relate to their environmental and social values. This theory supports the selection of specific attributes in this study by highlighting their relevance in shaping consumers' decision-making processes.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), formulated by Davis (1989), describes how users come to accept and use new technologies based on two main perceptions: perceived usefulness and perceived ease of use. These perceptions influence users' attitudes and behavioral intentions towards a product. In the context of this research, TAM aids in understanding how Generation Z's perceptions of the usefulness and ease of using sustainable packaging affect their preferences and willingness to adopt such packaging solutions. The model thus complements MAUT and MEC by focusing on cognitive evaluations that precede consumer behavior.

The integration of MAUT, MEC, and TAM in this study offers a robust theoretical foundation for analyzing Generation Z students' sustainable packaging preferences. MAUT provides the quantitative basis for ranking attribute combinations, MEC contextualizes these preferences by linking attributes to values, and TAM explains the cognitive processes influencing acceptance and use. Together, these theories facilitate a holistic understanding of how Generation Z evaluates and decides upon sustainable packaging options. As shown in Figure 1, this integrated framework guides the conceptualization and analysis of the study, highlighting the interplay between product attributes, consumer values, and acceptance factors.

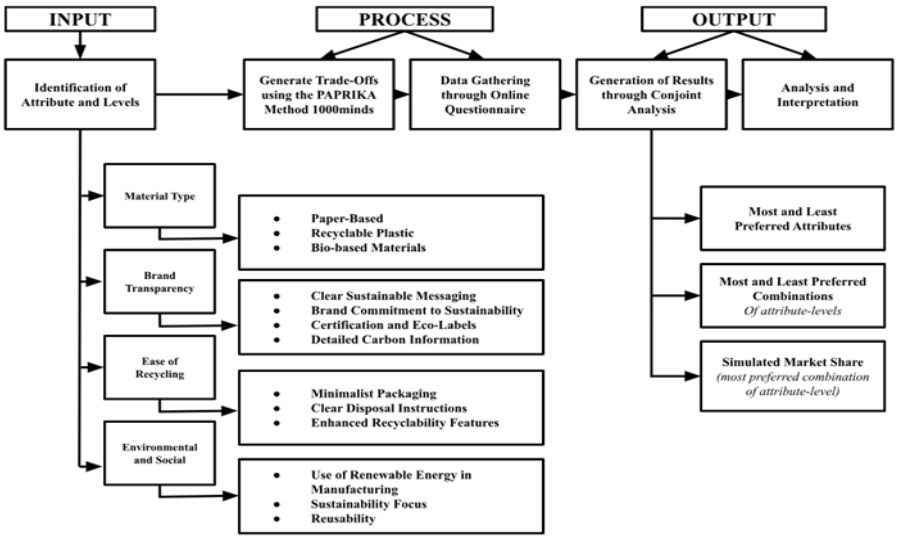

Figure 1. Conceptual Framework

METHODOLOGY

This study utilized a descriptive correlational research design to explore the relationships between sustainable packaging attributes and Generation Z consumer preferences without manipulating any variables. The design enabled the examination of correlations between packaging features—such as material type, brand transparency, ease of recycling, and environmental and social practices—and consumer choices. Through conjoint analysis, the study identified patterns and assessed the importance of attribute combinations valued by Gen Z.

Data were gathered from Generation Z college students (born 1996–2006) enrolled in ten universities in Davao City. Five universities had implemented bans on single-use plastics (Ateneo de Davao University, San Pedro College, Holy Cross of Davao College, University of Immaculate Conception, University of Southeastern Philippines), while five had no such bans (Davao Doctors College, STI College of Davao, AMA Computer College of Davao, University of Mindanao, Joji Ilagan International School).

The study sampled 300 respondents, a size appropriate for reliable conjoint analysis. Prior research suggests that a sample between 100 and 400 participants is adequate for such studies, ensuring robust and valid results (Conjointly, 2019; Phou, Norng, & Hann, 2024).

Quota and purposive sampling methods were combined. Quota sampling involved collecting 30 responses daily over two weeks (from March 1 to March 14, 2025) to reach the target sample size. Purposive sampling ensured participants met criteria including being Generation Z, current university enrollment, and verification through institutional email addresses.

Data collection followed a structured process beginning with pre-testing on January 23–24, 2025, involving 30 respondents to assess reliability and clarity. Pilot testing occurred on January 26–27, 2025, refining the survey with feedback from 30 respondents plus a 20% buffer for non-response. The main survey was administered between March 1 and March 14, 2025, to 300 participants using the 1000minds software platform. Researchers facilitated access through QR codes and provided technical support when needed. Participant responses were verified through email to ensure data validity. After collection, data cleaning excluded inconsistent or incomplete responses.

The instrument combined qualitative and quantitative methods. Key Informant Interviews (KII) and Focus Group Discussions (FGD) identified relevant sustainable packaging attributes. The quantitative survey, conducted via 1000minds software, employed the PAPRIKA conjoint analysis method, allowing participants to rank pairs of attribute combinations. Pre-test and pilot results showed strong reliability (Kendall's W and Spearman's rank correlation above 0.73). The survey instrument was refined to ensure clarity for respondents with varying familiarity with sustainability concepts.

The key attributes studied included material type (paper-based, recycled plastic, bio-based materials), brand transparency (clear messaging, sustainability commitment, certifications, carbon footprint details), ease of recycling (minimalist packaging, disposal instructions, recyclability features), and

environmental and social practices (renewable energy use, sustainability focus, reusability).

Data analysis employed the PAPRIKA method to determine preferred attribute combinations and simulate market shares. Kendall's Coefficient of Concordance (W) and Spearman's rank correlation assessed agreement and consistency among respondents' preferences. Demographic data were analyzed using frequencies and percentages, while utility scores identified the most and least preferred attributes.

Voluntary participation was ensured, with informed consent obtained at the start of the survey, including a data privacy statement. Respondents were free to withdraw at any time without penalty. Anonymity and confidentiality were maintained, with no personal identifiers required. Data were securely stored and accessible only to the research team. Care was taken to avoid causing discomfort or harm through survey content.

RESEARCH RESULT

Overview of Demographics

As shown in Figure 2, the study's respondents were primarily aged between 19 and 23 years old, representing a key segment of Generation Z, which is widely acknowledged for its heightened environmental and sustainability awareness (John, 2023). Participants were drawn from universities in Davao City that either implemented or did not implement bans on single-use plastics (SUP). From the initial pool of 300 survey participants, data cleaning and screening based on eligibility criteria resulted in a final valid sample of 301 respondents, with 200 (66.4%) from institutions enforcing SUP bans and 101 (33.6%) from those without such policies. This disparity in representation likely reflects differences in institutional regulations and varying levels of student engagement with sustainable practices across these universities.

Regarding gender, the sample was diverse and inclusive: 47.2% identified as female, 44.5% as male, and 8.4% reported other gender identities. This range ensures the study captures a wide spectrum of perspectives on sustainable packaging preferences within Generation Z. In terms of institutional distribution, the universities enforcing SUP bans — Ateneo de Davao University, San Pedro College, Holy Cross of Davao College, University of Immaculate Conception, and University of Southeastern Philippines — each contributed roughly 13.3% of the total respondents. Conversely, universities without SUP bans collectively represented 33.4% of the sample, with participation spread across Davao Doctors College, STI College of Davao, AMA Computer College of Davao, University of Mindanao, and Joji Ilagan International School.

The purchasing behavior of respondents revealed varying levels of engagement with sustainable products. Approximately 40.5% reported purchasing beverages with sustainable packaging on a daily basis, while 46.5% made such purchases weekly, and 13.0% did so monthly. These patterns suggest differences in commitment to or accessibility of sustainable beverage options among Generation Z consumers in Davao City.

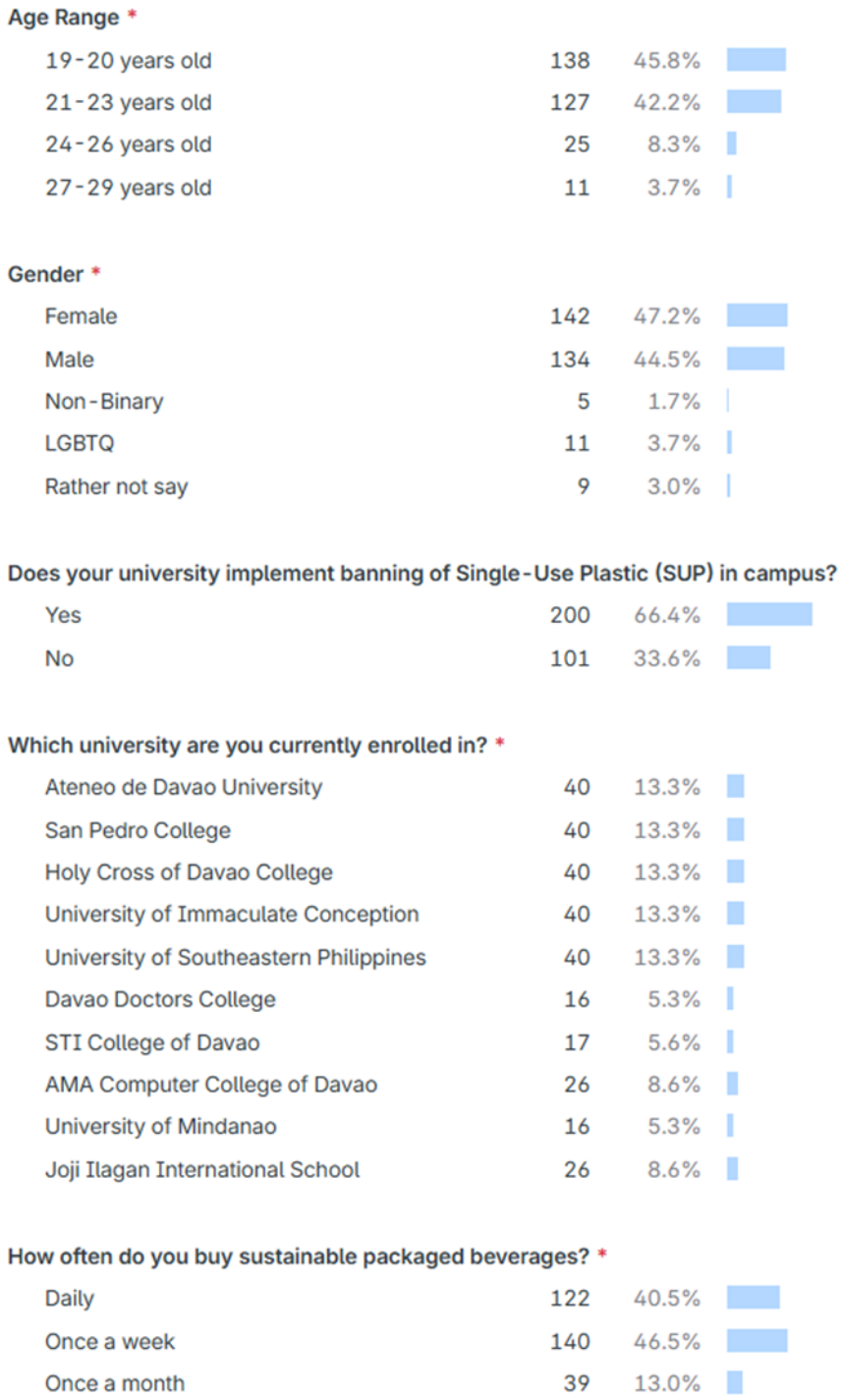

Figure 2. Demographic Profile of Respondents

Most and Least Important Attributes

As shown in Figure 3, the conjoint analysis results identified the most important attributes influencing sustainable packaged beverage preferences among Generation Z college students in Davao City. Brand transparency emerged as the most significant attribute, with a utility score of 31.4%, reflecting Gen Z's strong eco-consciousness and preference for sustainability in their purchasing decisions (Shaw, 2024). Environmental and Social Practices followed closely with a utility score of 25.3%, indicating that students are highly aware of

climate change impacts and seek to align their consumption with environmental and social values (Lopes et al., 2024). Material Type ranked third with a utility score of 25.0%, demonstrating the importance placed on the type of packaging material. Ease of Recycling, while still influential, received the lowest utility score at 18.3%, suggesting it is a less critical factor in decision-making for this demographic.

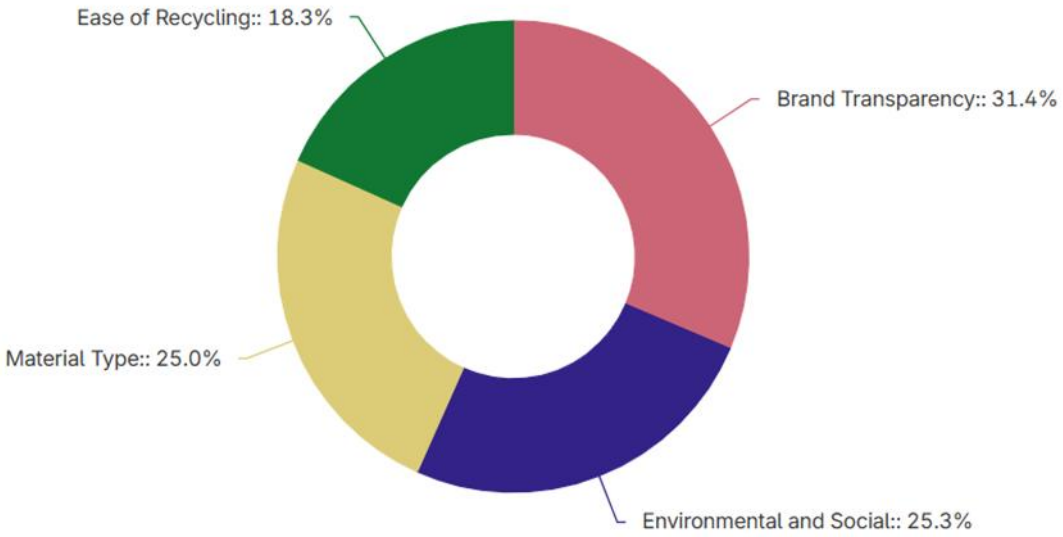

Figure 3. Relative Importance of Attributes

Most and Least Preferred Combination of Attribute Levels

Table 1 provides important insights into the most and least preferred combinations of attribute levels for sustainable packaged beverages among Generation Z college students in Davao City. As shown in the table, the most preferred packaging, Package 108, achieved a score of 100%. This package comprised paper-based material (Material Type), clear sustainable messaging (Brand Transparency), minimalist packaging (Ease of Recycling), and the use of renewable energy in manufacturing (Environmental and Social Practices). These preferences demonstrate Gen Z's strong inclination toward eco-friendly materials, transparent brand communication, and renewable energy use in packaging.

Conversely, Package 1 received a score of 0%, marking it as the least preferred combination among the respondents. This package consisted of bio-based materials (Material Type), detailed carbon footprint information (Brand Transparency), enhanced recyclability features (Ease of Recycling), and reusability (Environmental and Social Practices). The findings suggest that Gen Z students prioritize packaging attributes that reflect simplicity, transparency, and immediate environmental impact over more complex or technical features.

The consistency of preferences among Generation Z students was supported by two statistical measures: Kendall's Coefficient of Concordance (W) and Spearman's rank correlation coefficient. Kendall's W of 0.771 indicates a strong agreement among participants regarding their rankings. Similarly, Spearman's rank correlation coefficient of 0.768 confirms substantial consistency in preferences. Values between 0.60 and 0.80 are generally interpreted as

indicating substantial agreement, thus supporting the reliability of these results (Garcia & Campos, 2022).

Kendall's W assesses the ordinal consistency of rankings and implies that the scores are independent with a monotonic relationship. Spearman's rank correlation further measures the strength and direction of relationships between variables. Together, these statistics suggest a strong monotonic association among preference variables, reinforcing the validity and stability of the data across the Gen Z segments sampled. This robust agreement minimizes the likelihood that the results occurred by chance and confirms the reliability of the study's findings.

Table 1. Most and Least Preferred Combinations of Attribute Levels

#	Rank	Score	Material Type	Brand Transparency	Ease of Recycling	Environmental and Social Practices
Package 108	1st	100%	paper-based	clear sustainable messaging	minimalist packaging	use of renewable energy in manufacturing
Package 105	2nd	90.6%	paper-based	clear sustainable messaging	clear disposal instruction	use of renewable energy in manufacturing
Package 99	3rd	89.6%	paper-based	brand commitment to sustainability	minimalist packaging	use of renewable energy in manufacturing
Package 10	106th	10.9%	bio-based materials	certifications and eco-labels	enhanced recyclability features	reusability
Package 4	107th	8.9%	bio-based materials	detailed carbon footprint information	clear disposal instructions	reusability
Package 1	108th	0.0%	bio-based materials	detailed carbon footprint information	enhanced recyclability features	reusability

DISCUSSION

This study offers important insights into the sustainable packaging preferences of Generation Z college students in Davao City, underscoring the critical role of brand transparency. Respondents consistently prioritized clear and honest communication of sustainability efforts by brands, demonstrating that this generation highly values openness regarding environmental commitments. A large proportion of participants frequently purchase sustainably packaged beverages, which further highlights their inclination toward eco-friendly packaging. Statistical measures confirm the consistency of these preferences, suggesting a strong collective alignment among Generation Z consumers in their emphasis on transparency and environmental responsibility.

The investigation into the four main packaging attributes revealed that brand transparency holds particular significance for students from universities without a policy banning single-use plastics. This preference aligns with Generation Z's broader tendency to favor straightforward sustainability messaging over more complex post-consumption features such as enhanced

recyclability. The findings reflect established consumer behavior theories, where individuals evaluate products based on attributes that resonate with their values and goals. This alignment indicates that transparent and simple communication of environmental practices is central to influencing the purchasing decisions of this demographic.

Challenges emerged in data collection among certain universities lacking official email systems or with restricted access to survey platforms, resulting in a limited and exploratory sample from this subgroup. This limitation suggests that while initial insights are valuable, more comprehensive research is needed to draw firm conclusions about these groups' preferences.

The study reinforces the interconnectedness of consumer values and product attributes, illustrating that Generation Z's purchasing behavior is shaped by the desire for authenticity and environmental accountability in packaging. Brands aiming to capture this market should prioritize transparent, environmentally conscious packaging strategies that reflect these preferences.

CONCLUSIONS AND RECOMMENDATIONS

The findings provide a clear picture of Generation Z college students in Davao City, highlighting a demographic profile predominantly aged 19 to 20 years and evenly split by gender. Among packaging attributes, brand transparency emerged as the most valued, followed closely by environmental and social practices, material type, and ease of recycling. The most favored packaging combines paper-based materials, clear sustainability messaging, minimalist design, and the use of renewable energy, whereas the least preferred option includes bio-based materials coupled with detailed carbon footprint data and enhanced recyclability features.

Theoretically, these outcomes affirm the applicability of consumer behavior models that emphasize attribute utility, value alignment, and technology acceptance. Practically, they suggest that beverage brands must align their packaging with Generation Z's sustainability values, emphasizing clarity and authenticity in messaging.

Based on these insights, it is recommended that on-the-go beverage providers transition to eco-friendly materials such as paper, accompanied by minimalist designs that effectively communicate sustainability efforts. Transparent messaging should be integrated into both packaging and marketing communications to build trust and engagement with consumers. Digital platforms offer strategic opportunities to share authentic sustainability stories and engage Generation Z through interactive campaigns and reward systems. Establishments should also continuously refine their packaging strategies based on consumer feedback and emerging innovations in sustainable materials.

Policy makers can leverage these findings to develop clearer guidelines and incentives that encourage adoption of sustainable packaging, coupled with public education campaigns and enhanced recycling infrastructure. Supporting businesses through subsidies and recognition programs will further drive industry-wide shifts toward environmental responsibility.

Generation Z consumers themselves play a vital role by supporting transparent and eco-conscious brands, advocating for honest sustainability claims, and making purchasing choices that align with their values. Educating themselves and others about sustainable consumption will help sustain momentum toward environmental stewardship.

Academic institutions are encouraged to deepen sustainability education within curricula and promote practical initiatives that reduce single-use plastics. This will prepare future consumers and professionals to engage meaningfully with sustainability challenges.

ADVANCED RESEARCH

This study's focus on Generation Z college students in Davao City limits the generalizability of its findings. Future research should expand demographic and geographic scope to include diverse age groups, regions, and socioeconomic backgrounds. Incorporating behavioral data and longitudinal designs could provide deeper understanding of how stated preferences translate into actual consumer behavior over time.

Exploring generational differences, as well as additional packaging attributes such as price sensitivity and durability, may reveal further dimensions of consumer decision-making. The role of skepticism toward greenwashing and its impact on trust and loyalty also warrants closer examination.

The unexpected finding that students in institutions without single-use plastic bans exhibited stronger sustainability preferences invites further investigation into cultural and behavioral factors influencing these patterns. Mixed-method approaches combining quantitative and qualitative techniques could enrich insights into consumer motivations.

Finally, methodological improvements through more representative sampling and the inclusion of external influences such as social media trends and peer effects would enhance the robustness of future studies. Tracking evolving consumer attitudes over time will provide valuable guidance for brands, policy makers, and educators aiming to promote sustainable consumption effectively.

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