



Consumer Attitudes Toward Recycled Products: A Comparative Study Across Generations

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Abstract

With the rise in awareness about environmental issues, consumers are becoming conscious of buying sustainable products. This study aims at understanding consumer behavior and willingness towards purchasing recycled products among three generations- Gen Z, millennials, and GenX. For this study, data were collected through an online structured survey conducted via Google Forms, and 162 responses were recorded from India. The collected data were analyzed using independent t- tests, ANOVA, and Pearson correlation coefficients. The results show that among individuals who have purchased recycled products, perceived risk was highest for Gen Z, followed by millennials and then Gen X. Moreover, Environmental concern was significantly greater among millennials, followed by Gen Z and then Gen X. In contrast, among those who have not purchased recycled products, concerns about quality and functionality were greatest for Gen Z, followed by Gen X and then millennials. Additionally, price concerns were greatest for Gen X, followed by Gen Z and then millennials. Subsequently, subjective norms, environmental concern, price, availability, perceived risk, and quality and functionality differ between consumers who have purchased recycled products and those who have not. Subjective norms, environmental concern, price, and quality and functionality are higher for the individuals who have bought recycled products, while perceived risk and availability are rated higher for those who have not bought recycled products. Finally, subjective norms, quality and functionality, environmental concern, price, and availability have a positive influential impact on purchase intention, while perceived risk is negatively correlated with purchase intention of a recycled product.

Keywords: Generations; Consumers; Recycled Products; Environment; Price; GenZ; Millennials; GenX

1. Introduction

1.1. General Background

Environmental degradation, escalating waste generation, and the rapid depletion of natural resources have become critical global challenges. Unsustainable product consumption is leading to pollution, biodiversity loss, and global warming. The huge amount of waste leads to contamination of land and water (Glavič, 2021). Water is being polluted faster than nature can recycle and purify it in rivers and lakes. These practices are the reason there is strain on human activities. Sustainable consumption involves choices like reducing consumption, reusing items, recycling, choosing eco-friendly products, and saving energy, which helps meet human needs and increases the quality of life. Recycled and upcycled products are key components of a circular economy as they minimise waste and maximise resource efficiency. Recycled products are waste items that have been broken down, processed, and reused instead of being discarded. Upcycled products are items created from raw waste which have been transformed to products of higher value and quality. Waste materials are often recycled into ubiquitous products like denim jeans, accessories, footwear, vases, and other decorative items. These products help divert the amount of waste sent to landfills and incinerators; this reduces soil, air, and water pollution. They also lower environmental impact by decreasing the need for raw material extraction and reducing pollution associated with conventional manufacturing (Aiguobarueghian et al., 2024). These products require less energy, which leads to lower greenhouse emissions.

Consumer choices and purchasing behavior play a crucial role in promoting sustainability, as purchasing power drives market demand. Consumers directly affect how products are designed, produced, and distributed. When customers purchase recycled products, they create a demand for eco-friendly products, which compels businesses to adopt these practices. Consumer adoption depends on many factors such as price, physical appearance and design of the product, availability, and quality. Even though availability is one of the major factors affecting consumer adoption, if a product is

easily available but has a very high price and is not physically appealing, the customers will choose to not buy it. Despite growing environmental concerns among customers, this does not always lead to sustainable purchasing behaviour. Many individuals are concerned about the environment and protecting it, but the price, convenience, and brand of the products affect their buying decision-making. This gap between environmental values and actual consumer behavior highlights the challenges that will be faced for the adoption of sustainable consumption (Gupta et al., n.d.). Environmental awareness plays a significant role in shaping consumer attitudes toward sustainable products by increasing concern about the environment. Consumers who are more concerned about the environment tend to buy more eco-friendly products. Consumers feel a sense of obligation and responsibility, which inclines them to buy sustainable products. As pollution and waste continue to increase, it is important to build a more positive attitude toward recycled goods. Although recycled products may seem unusual at first, choosing them can make a real difference (Kanimozhi and Vinayagam, 2023). Small actions, such as buying recycled items, can help reduce waste and protect the environment. Over time, this shift in mindset can bring long-term benefits for both people and the planet.

1.2. Specific Background

The perception of consumers has been explored evidently in the existing research studies. One such study conducted by Lakatos et al. (2018) aimed to study the attitude towards the environment and the adoption of sustainable models among consumers in Romania. The instrument used was a questionnaire to interview consumers of all ages, genders, and educational categories. The respondents were asked the factors that were important to individuals if they preferred renting or buy sustainable products. The research concludes that people aged 35-44 have the most concern about the environment and are willing to adopt new sustainable methods. However, respondents aged 18-34 show less concern about the environment, and it will be difficult to target those people.

Subsequently, a similar study by Borusiak et al. (2020) was undertaken to understand customer buying patterns for second-hand products and sustainable consumption. An online survey questionnaire was conducted in the cities of Poznań, Warsaw, and Katowice to collect the primary data. The results revealed that positive attitudes showed that they were favourable to buying second-hand products, and personal norms have a strong influence on buying second-hand products. Moreover, environmental awareness and knowledge of the consequences of overusing plastic products help people shift to recycled products. Finally, societal norms reduce the impact, making people more likely to buy second-hand products as one thinks that the other does not approve of second-hand products.

In the same realm, research aimed to analyse the internal and external factors that affected the adoption of sustainable consumption in Lithuania. The data were collected by a quantitative online survey that used snowball sampling. Both internal and external factors had a direct positive effect on buying sustainable products. The environmental attitude, social environment, responsibility, and behavior all positively affect sustainable consumption. People are more likely to buy green products when they care about the environment, feel responsible, and believe their actions matter. Moreover, the findings suggest that sustainable consumption is shaped not only by individual beliefs but also by the surrounding social context. This means that encouragement from family, friends, and wider society can strengthen buying habits. The study therefore highlights the importance of combining awareness-building with supportive social norms to increase sustainable product adoption (Piligrimienė et al., 2020).

Another study conducted by Ruokamo et al. (2022) aimed to study how consumers reacted to recycled plastics and their usage. The data were collected from a survey of around 300 respondents, which was administered online in Webropo. It was seen from the results that 60% of the people had bought recycled products before, and 93% of them stated that they were happy with it and would buy it again in the future. It was noticed that suitability, high quality, longevity, and safety are considered clearly as the most important features when buying a recycled product. Unexpectedly, researchers found out that the use of recycled plastic in a plastic product increases the attractiveness. Finally, the study indicated that females are more likely to buy recycled products than men.

In particular, to E-waste recycling, a study aims to find out the types of consumers willing to purchase these products. The data were collected by a survey method through an online crowdsourcing platform in mainland China. In the two surveys, a semi-experimental design method was applied to understand how consumers' responses change when provided with information about the points reward system. Clustering analysis, variance analysis, and hierarchical clustering were used for the data analysis. The results showed that consumers generally had a strong environmental protection mindset and a favorable attitude toward e-waste recycling. The study also found that consumer groups differed significantly in

subjective norm, perceived behavioral control, recycling motivation, points incentives, points redemption, and recycling behavioral intentions (Zhong et al., 2022).

Finally, research conducted by Prakash and Pathak (2016) aimed to understand the intentions of young consumers to buy eco-friendly products in India. The data were collected by a questionnaire, and responses were analysed for 204 Indian consumers. and analysed using tables, graphs, and measurement models. The study stated that Indians were willing to purchase products, but if the packaging had some new items, then the likelihood of purchasing would increase. The study suggests that Indian consumers already show a willingness to purchase eco-friendly packaged products, but this intention becomes even stronger when the packaging includes additional environmentally responsible or innovative features.

1.3. Research Gap and Rationale for the Study

The studies conducted so far on consumer perception of recycled products are mostly done in Western countries and hence could not be applied to the Indian scenario, as there are great cultural values, buying habits, and environmental consciousness among Indians. Moreover, the existing research tends to focus on consumers' attitudes towards recycled products at a general level, while few studies focus on the differences between generations. Consequently, there is a lack of awareness about the variation in perceptions, preferences, and purchase intentions of consumers across different age groups in India.

One of the other gaps is that previous studies are highly dependent on secondary data and data sets. These methods give only superficial information about the reasons, worries, and obstacles that affect consumers in their decision-making process. Thus, there is a need for primary, consumer-level evidence that can measure attitudes toward recycled products and examine the factors influencing consumers' purchasing behavior and the reasons why consumers are reluctant to buy recycled products.

The need for sustainable consumption practices is increasingly felt due to the increasing problem of environmental degradation, climate change, and resource scarcity. The recycling of products has a key role to play in cutting down the amount of waste generated, in promoting the use of natural resources and in supporting the transition from a linear to a circular economy. All this is despite the advantages that recycled products offer, there is still a relatively low level of consumer acceptance.

To promote sustainable consumption, it is thus important to understand the factors that have an impact on consumer perceptions and purchasing decisions. This study explores generational differences among Indian consumers, offering region-specific knowledge about the impact of age differences on attitudes and intentions of consumers towards recycled products. Further, the primary survey data will also provide strong empirical evidence on the barriers, motivations, and perceptions that influence consumer behavior. The results help to bridge the gap between concern and purchasing actions and offer insights for policymakers, the industry, and environmental activists who want to promote the use of recycled products.

2. Methodology

2.1. Research aim and objectives

This study aims to examine consumers' perceptions and purchase intentions toward recycled products, with a particular focus on generational differences and the factors influencing sustainable purchasing behaviour. It seeks to identify how subjective norms, perceived risk, price, quality and functionality, environmental concern, and product availability shape consumer decisions and attitudes toward recycled products. The following objectives are explored in this research.

- To examine the effect of generational differences on recycled product purchasing behavior and purchase intentions with respect to subjective norms, perceived risk, price, quality and functionality, environmental concern, and non-availability.
- To compare purchasers and non-purchasers of recycled products based on subjective norms, perceived risk, price, quality and functionality, environmental concern, non-availability, and purchase intention.
- To analyze the relationship between purchase intention and key influencing factors, namely subjective norms, perceived risk, price, quality and functionality, environmental concern, and non-availability.
- To identify the factors that significantly influence consumers' purchase intentions toward recycled products and assess their relative importance across different consumer groups.

2.2. Research Hypothesis

The following hypotheses were assumed and evaluated through an independent t-test.

NH1: There is no difference between the Yes and No groups with respect to the dependent variable Subjective Norms

NH2: There is no difference between the Yes and No groups with respect to the dependent variable Perceived Risk

NH3: There is no difference between the Yes and No groups with respect to the dependent variable quality and functionality

NH4: There is no difference between the Yes and No groups with respect to the dependent variable environmental concern

NH5: There is no difference between the Yes and No groups with respect to the dependent variable price

NH6: There is no difference between the Yes and No groups with respect to the dependent variable nonavailability

NH7: There is no difference between the Yes and No groups with respect to the dependent variable purchase intention

The hypotheses given below are assumed and evaluated through an ANOVA test.

NH8: Generational differences do not significantly influence recycled product purchasing behavior across subjective norms, perceived risk, price, quality and functionality, environmental concern and non-availability.

NH9: Generational differences do not significantly influence the likelihood of not purchasing recycled products across subjective norms, perceived risk, price, quality and functionality, environmental concern and non-availability.

NH10: There is no significant difference between purchasers and non-purchasers of recycled products based on subjective norms, perceived risk, price, quality and functionality, environmental concern and non-availability.

NH11: There is no significant correlation between purchase intentions and individual factors including subjective norms, perceived risk, price, quality and functionality, environmental concern and non-availability.

The following hypotheses were assumed and evaluated through correlation analysis.

NH12: There is no correlation between Subjective Norms and Purchase intention

NH13: There is no correlation between perceived risk and Purchase intention

NH14: There is no correlation between quality and functionality and Purchase intention

NH15: There is no correlation between environmental concern and Purchase intention

NH16: There is no correlation between price and Purchase intention

NH17: There is no correlation between non-availability and Purchase intention

2.3. Data Collection Tool and Process

Data for this study were collected through a structured questionnaire administered using Google Forms. The survey link was distributed via email, WhatsApp, and social media platforms to reach the target respondents. Responses were recorded on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire measured seven constructs related to recycled product purchasing behaviour: Subjective Norms (4 items), Perceived Risk (6 items), Quality and Functionality (4 items), Environmental Concern (3 items), Availability (3 items), Purchase Intention (3 items), and Price (3 items). The measurement scales for all constructs were adapted from the study by Dobbstein and Lochner (2023).

2.4. Sampling and Sample Characteristics

There were 103 people who have purchased recycled products before and 56 people who have not purchased them before. The study is further analysed according to these two groups: Those who have purchased recycled products and those who have not.

2.4.1. Sample characteristics of the non-buyers of recycled products

The non-buyer sample comprised 56 respondents from three age groups. Respondents aged 29–44 years constituted the largest share (40.0%), followed by those aged 13–28 years (34.5%) and 45–60 years (25.5%). In terms of gender, 20 respondents were female, while the remaining 36 were male. With respect to employment status, 29.1% of the respondents were salaried employees, 25.5% were self-employed, 23.6% were students, 18.2% were homemakers, and 3.6% were not working. Regarding annual income, 20.0% of the respondents were students, 20.0% earned ₹10–15 lakhs, 18.2% earned

more than ₹20 lakhs, 16.4% were not earning, 9.1% earned up to ₹5 lakhs, 9.1% earned ₹15–20 lakhs, and 7.3% earned ₹5–10 lakhs.

2.4.2. Sample characteristics of the buyers of recycled products

The buyer sample included respondents from three age groups, with 39.2% aged 45–60 years, 31.4% aged 13–28 years, and 29.4% aged 29–44 years. In terms of gender, 61.8% of the respondents were female, 36.3% were male, and 2.0% preferred not to disclose their gender. Regarding employment status, 36.3% of the respondents were salaried employees, 28.4% were self-employed, 22.5% were students, 11.8% were homemakers, and 1.0% were not working. In terms of annual income, 30.4% earned more than ₹20 lakhs, 22.5% were students, 12.7% earned ₹10–15 lakhs, 11.8% were not earning, 10.8% earned ₹5–10 lakhs, 6.9% earned up to ₹5 lakhs, and 4.9% earned ₹15–20 lakhs.

2.5. Statistical tools and techniques

The study aims were addressed and the proposed hypotheses tested with three statistical techniques. Independent samples t-tests were conducted to compare the means of buyers and non-buyers on the subjective norms, perceived risk, quality and functionality, environmental concern, availability, price, and purchase intention. Analysis of Variance (ANOVA) was used to determine if there was a significant difference between these variables among the three generational groups. Finally, correlation analysis was performed to examine the correlation between purchase intention and the key factors that influence consumers to buy recycled products.

2.6. Ethical Considerations

The present research adhered to all the ethical guidelines. The survey was voluntary, and informed consent was obtained from each participant before data collection. The questionnaire was anonymous (no personally identifiable information collected). Participants were told that their answers would only be used for research into academic studies. The confidentiality of all respondents was maintained by keeping all data confidential, securely stored, and exclusively used in the analysis for this study.

3. Results

3.1. T-test results

Table 1. Results of t-test conducted to assess the difference between buyers and non-buyers of recycled products based on the factors

Hypotheses	Group	N	Mean	SD	Levene's test p-value	t-statistic	T-test p-value
SN _Y - SN _N	SN _Y	102	0.38	3.88	0.474	2.77	0.006
	SN _N	55	0.54	4.02			
PR _Y - PR _N	PR _Y	102	13.54	2.76	0.413	-5.48	<.001
	PR _N	55	18.76	2.45			
QF _Y - QF _N	QF _Y	102	0.22	2.27	0.001	4.1	<.001
	QF _N	55	0.47	3.47			
EC _Y - EC _N	EC _Y	102	12.82	2.57	0.178	3.93	<.001
	EC _N	55	11.04	2.97			
P _Y - P _N	P _Y	102	0.24	2.47	0.593	4.78	<.001
	P _N	55	0.32	2.39			
NA _Y - NA _N	NA _Y	102	0.2	1.98	0.013	-3.34	0.001
	NA _N	55	0.38	2.85			

Table 1 represents the results of an independent t-test measuring the differences in the factors influencing buying behaviour of recycled products between buyers and non-buyers. The null hypothesis for Levene's test is that there are equal variances. If the p-value is greater than 0.05, the null hypothesis is not rejected, and hence, the p-value of the t-test with equal variances is analysed. It can be seen that the p-value of Levene's test for the hypothesis with variables subjective norms, perceived risk, environmental concern, and price is greater than 0.05, and hence, the p-value of the t-test with equal variance is evaluated. On the other hand, the p-value of Levene's test for quality and functionality and non-availability are less than 0.05; hence, the p-value of the t-test with unequal variance is assessed. Subsequently, the p-values of the t-test for all the hypotheses are less than 0.05, indicating rejection of all the null hypotheses. Therefore, there is a difference in subjective norms, perceived risk, price, environmental concern, quality and functionality, and non-availability between those individuals who have bought recycled products and those who haven't. According to the average values, subjective norms, quality and functionality, environmental concern, and price are influencing the people who are buying recycled products more as compared to those who do not buy. Contrarily, perceived risk and non-availability of recycled products are rated higher for those individuals who do not purchase recycled products.

3.2. ANOVA Results

3.2.1 Buyers of Recycled Products

This section presents the findings of the one-way ANOVA analysis assessing generational differences in the factors influencing recycled product purchase decisions among respondents with prior experience purchasing recycled products.

Subjective Norms

Table 2. Comparison of Subjective Norm Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	11.88	3.45
Millennials	30	10.1	4.17
Gen X	40	11.73	3.87
Total	102	11.29	3.88

As shown in Table 2, the mean score for SN is 11.29 out of 20. Therefore, it can be depicted that the societal expectations for an individual to purchase recycled products are not high enough. Between the age groups, society is expecting more from Gen Z (mean=11.88, sd=3.45) and Gen X (mean=11.73, sd=3.87) to buy recycled products as compared to millennials (mean=10.1, sd=4.17).

Table 3. One-Way ANOVA Testing Differences in Subjective Norm Scores Among Generations (Buyers)

		df	Mean Square	F	p
What is your age group?	61	2	30.5	2.07	0.132
Residual	1458.18	99	14.73		
Total	1519.18	101			

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to the SN. Therefore, the expectations of society to buy recycled products are similar for all the age groups or generations.

Perceived Risk

Table 4. Comparison of Perceived Risk Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	14.84	6.52
Millennials	30	14.23	5.14
Gen X	40	11.98	4.58
Total	102	13.54	5.51

The table shows that the total mean value of the score of PR is 13.54 out of 30. Hence, it can be said that the perceived risk of purchasing recycled products by an individual is low or moderate. Between the age groups, the perceived risk is scored higher for Gen Z (mean=14.84, sd=6.52) followed by millennials (mean=14.23, sd=5.14), to buy recycled products as compared to Gen X (mean = 11.98, sd = 4.58).

Table 5. One-Way ANOVA Testing Differences in Perceived Risk Scores Among Generations (Buyers)

		df	Mean Square	F	p	η2
What is your age group?	166.78	2	83.39	2.84	0.063	0.05
Residual	2902.56	99	29.32			
Total	3069.34	101				
Bonferroni Test						
	Mean diff.	Std. Error	t	p	95% CI lower limit	95% CI upper limit
Gen Z - Gen X	2.87	1.28	2.23	0.083	-0.26	6
Gen Z Millennials	0.61	1.38	0.44	1	-2.74	3.96
Gen X Millennials	-2.26	1.31	-1.73	0.262	-5.44	0.93

The descriptive statistics are supported by the ANOVA results. Since the p-value is less than 0.1, the null hypothesis is rejected. Hence, there exists a difference between the generations with respect to perceived risk. Therefore, the level of perceived risk to purchase a recycled product is different for the generations. However, this effect is very low as shown by the η^2 (0.05), and the difference is only significant between Gen Z and GenX (0.083), as tested by the Bonferroni test.

Quality and Functionality

Table 6. Comparison of Quality and Functionality Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	13.72	2.52
Millennials	30	14.37	2.03
Gen X	40	14.6	2.22
Total	102	14.25	2.27

As shown in the table, the mean score for Q&F is 14.25 out of 20. Therefore, it can be depicted that the quality and purpose of purchasing recycled products from an individual is high. Between the age groups, trust in buying recycled products is more from millennials (mean=14.6, sd=2.22) and Gen X(mean=14.37, sd=2.03) as compared to GenZ.(mean=13.72, sd=2.52)

Table 7. One-Way ANOVA Testing Differences in Quality and Functionality Scores Among Generations (Buyers)

		df	Mean Square	F	p
What is your age group?	14.34	2	7.17	1.4	0.252
Residual	507.04	99	5.12		
Total	521.37	101			

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to the Q&F. Therefore, the trust of individuals to buy recycled products is similar for all the age groups or generations.

Environmental Concern

Table 8. Comparison of Environmental Concern Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	12.41	2.92
Millennials	30	13.93	1.6
Gen X	40	12.33	2.66
Total	102	12.82	2.57

The table shows that the total mean value of the score of EC is 12.82 out of 15. Hence, it can be said that the perceived risk of purchasing recycled products by an individual is high. Between the age groups, the environmental concern is scored higher for GenX (mean=13.93, sd=1.6) followed by GenZ(mean=12.41, sd=2.92) as compared to millennials (mean=12.33, sd=2.66)

Table 9. One-Way ANOVA Testing Differences in Environmental Concern Scores Among Generations (Buyers)

		df	Mean Square	F	p	η^2
What is your age group?	52.46	2	26.23	4.23	0.017	0.08
Residual	614.36	99	6.21			
Total	666.82	101				
Bonferroni Test						
	Mean diff.	Std. Error	t	p	95% CI lower limit	95% CI upper limit
Gen Z - Gen X	0.08	0.59	0.14	1	-1.36	1.52
Gen Z - Millennials	-1.53	0.63	-2.41	0.053	-3.07	0.01
Gen X - Millennials	-1.61	0.6	-2.67	0.026	-3.07	-0.14

The descriptive statistics are supported by the ANOVA results. Since the p-value is less than 0.1, the null hypothesis is rejected. Hence, there exists a difference between the generations with respect to environmental concern. Therefore, the level of environmental concern to purchase a recycled product is different for the generations. However, this effect is moderate as shown by the η^2 (0.08), and the difference is only significant between Gen Z and millennials (0.08), as tested by Bonferroni's test.

Price

Table 10. Comparison of Price Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	9.47	2.88
Millennials	30	9.93	2.66
Gen X	40	10.1	1.93
Total	102	9.85	2.47

As seen in the table, the total mean value of the score of price is 9.85 out of 15. Therefore, it can be depicted that price affects the individual to purchase recycled products moderately. Between the age groups, price plays a crucial role for millennials (mean=10.1, sd=1.93) and Gen X(mean=9.93, sd=2.66) as compared to GenZ.(mean=9.47, sd=2.88)

Table 11. One-Way ANOVA Testing Differences in Price Scores Among Generations (Buyers)

		df	Mean Square	F	p
What is your age group?	7.36	2	3.68	0.6	0.552
Residual	609.44	99	6.16		
Total	616.79	101			

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to the price. Therefore, the effect of price regarding the purchase of recycled products is similar in all generations.

Non-Availability

Table 12. Comparison of Non-Availability Scores Across Generational Cohorts: Descriptive Statistics (Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	32	8.91	2.29
Millennials	30	9.53	1.72
Gen X	40	8.8	1.88
Total	102	9.05	1.98

As seen in the table, the total mean value of the score of nonavailability is 9.05 out of 15. Therefore, it can be depicted that the availability of recycled products does affect the purchasing intention of individuals. Between the age groups, availability affects Gen X (mean=9.53, sd=1.72) and Gen Z (mean=8.91, sd=2.29) as compared to millennials (mean=8.8, sd=1.88).

Table 13. One-Way ANOVA Testing Differences in Non-Availability Scores Among Generations (Buyers)

		df	Mean Square	F	p
What is your age group?	10.17	2	5.08	1.3	0.277
Residual	386.59	99	3.9		
Total	396.75	101			

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to nonavailability. Therefore, the availability of recycled products affecting the purchase intention is similar for all the age groups or generations.

3.2.2. Those who have not purchased recycled products

Subjective Norms

According to Table 14, the total mean value of the score of SN is 9.47 out of 20. Therefore, it can be depicted that the societal expectations for an individual to purchase recycled products are not high enough. Between the age groups, society is expecting more from Gen X (mean=10.29, sd=4.95) and Gen Z(mean=9.89, sd=4.25) to buy recycled products as compared to millennials.(mean=8.59, sd=3.08)

Table 14. Comparison of Subjective Norm Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	9.89	4.25
Millennials	22	8.59	3.08
Gen X	14	10.29	4.95
Total	55	9.47	4.02

Table 15. One-Way ANOVA Testing Differences in Subjective Norm Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p
What is your age group?	29.74	2	14.87	0.92	0.406
Error	843.96	52	16.23		

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to the SN. Therefore, the expectations of society to buy recycled products are similar for all the age groups or generations.

Perceived Risk

Table 16. Comparison of Perceived Risk Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	17.16	5.5
Millennials	22	20.55	4.85
Gen X	14	18.14	7.83
Total	55	18.76	6.02

The table shows that the total mean value of the score of PR is 18.76 out of 30. Hence, it can be said that the perceived risk of purchasing recycled products by an individual is high. Between the age groups, the perceived risk is scored higher for Gen X (mean=20.55, sd=4.85), followed by millennials (mean=18.14, sd=7.83), to buy recycled products as compared to Gen Z (mean=17.16, sd=5.5)

Table 17. One-Way ANOVA Testing Differences in Perceived Risk Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p
What is your age group?	124.23	2	62.12	1.76	0.182
Error	1835.7	52	35.3		

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to perceived risk. Therefore, the perceived risk to buy purchase recycled products is similar for all the age groups or generations.

Quality and Functionality

Table 18. Comparison of Quality and Functionality Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	13.58	2.36
Millennials	22	11	3.73
Gen X	14	11.93	3.81
Total	55	12.13	3.47

As shown in the table, the mean score for Q&F is 12.13 out of 20. Therefore, it can be depicted that the quality and purpose of purchasing recycled products from an individual is high. Between the age groups, trust in buying recycled products is more from genZ (mean=13.58, sd=2.36) and Gen X(mean=11.93, sd=3.81) as compared to millennials (mean=11, sd=3.73).

Table 19. One-Way ANOVA Testing Differences in Quality and Functionality Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p	η^2
What is your age group?	68.55	2	34.27	3.06	0.055	0.11
Residual	581.56	52	11.18			
Total	650.11	54				
Bonferroni Test						
	Mean diff.	Std. Error	t	p	95% CI lower limit	95% CI upper limit
Gen Z - Gen X	1.65	1.18	1.4	0.501	-1.26	4.56
Gen Z - Millennials	2.58	1.05	2.46	0.051	-0.01	5.17
Gen X - Millennials	0.93	1.14	0.81	1	-1.9	3.76

The descriptive statistics are supported by the ANOVA results. Since the p-value is less than 0.1, the null hypothesis is rejected. Hence, there exists a difference between the generations with respect to quality and functionality. Therefore,

the quality of recycled products affects consumer choice. However, this effect is moderate, as shown by the η^2 (0.11), and the difference is only significant between Gen Z and millennials (2.58), as tested by Bonferroni's test.

Environmental Concern

Table 20. Comparison of Environmental Concern Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	10.74	3.16
Millennials	22	11	1.8
Gen X	14	11.5	4.16
Total	55	11.04	2.97

The table shows that the total mean value of the score of EC is 11.04 out of 15. Hence, it can be said that the concern about the environment while buying a recycled product is kept in mind. Between the age groups, the environmental concern is scored higher for GenX (mean=11.5, sd=4.16), followed by millennials (mean=11, sd=1.8), as compared to GenZ (mean= 10.74, sd=3.16).

Table 21. One-Way ANOVA Testing Differences in Environmental Concern Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p
What is your age group?	4.74	2	2.37	0.26	0.772
Error	473.18	52	9.1		

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to environmental concerns. Therefore, the concern of individuals for buying recycled products is similar for all the age groups or generations.

Price

Table 22. Comparison of Price Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	8.11	2.23
Millennials	22	7.14	2.51
Gen X	14	8.86	2.14
Total	55	7.91	2.39

As seen in the table, the total mean value of the price score is 7.91 out of 15. Therefore, it can be depicted that price affects the individual to purchase recycled products moderately. Between the age groups, price plays a crucial role for GenX (mean=8.86, sd=2.14) and Gen Z (mean=8.11, sd=2.23) as compared to millennials (mean=7.14, sd=2.51).

Table 23. One-Way ANOVA Testing Differences in Price Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p	η^2
What is your age group?	26.45	2	13.23	2.44	0.097	0.09
Residual	282.09	52	5.42			
Total	308.55	54				
Bonferroni Test						
	Mean diff.	Std. Error	t	p	95% CI lower limit	95% CI upper limit
Gen Z - Gen X	-0.75	0.82	-0.92	1	-2.78	1.28
Gen Z - Millennials	0.97	0.73	1.33	0.57	-0.84	2.77
Gen X - Millennials	1.72	0.8	2.16	0.106	-0.25	3.69

The descriptive statistics are supported by the ANOVA results. Since the p-value is less than 0.1, the null hypothesis is rejected. Hence, there exists a difference between the generations with respect to price. Therefore, the price for purchasing recycled products is different for the generations. However, this effect is moderate as shown by the η^2 (0.09), and the difference is only significant between GenX and millennials (1.72), as tested by the Bonferroni test.

Non-Availability

Table 24. Comparison of Non-Availability Scores Across Generational Cohorts: Descriptive Statistics (Non-Buyers)

Generation	n	Mean	Std. Deviation
Gen Z	19	10.63	3.77
Millennials	22	10.41	1.3
Gen X	14	10.43	3.34
Total	55	10.49	2.85

As seen in the table, the total mean value of the score of nonavailability is 10.49 out of 15. Therefore, it can be depicted that the availability of recycled products does affect the purchasing intention of individuals. Between the age groups, availability affects Gen Z (mean=10.63, sd=3.77) and millennials (mean=10.43, sd=3.34) as compared to GenX (mean=10.41, sd=1.3).

Table 25. One-Way ANOVA Testing Differences in Non-Availability Scores Among Generations (Non-Buyers)

		df	Mean Square	F	p
What is your age group?	0.58	2	0.29	0.03	0.966
Residual	437.17	52	8.41		
Total	437.75	54			

To statistically test the difference, an ANOVA test is conducted. Since the p-value is greater than 0.1, the null hypothesis cannot be rejected. Hence, there is no difference between the generations with respect to non-availability. Therefore, the availability of products affecting the consumers' purchase intention is similar for all generations.

3.3. Correlation Analysis

Finally, correlation analysis has been conducted to measure the direction and magnitude of the relationship between the purchase intentions and factors affecting the purchase intentions of recycled products.

Table 26. Pearson Correlation Coefficients (r) and p-values for Purchase Intention and Associated Factors

Variables	Metric	Purchase Intentions
Subjective Norms	Correlation	0.38
	p	<.001
Perceived Risk	Correlation	-0.39
	p	<.001
Quality and Functionality	Correlation	0.49
	p	<.001
Environmental Concern	Correlation	0.57
	p	<.001
Price	Correlation	0.63
	p	<.001
Non-Availability	Correlation	0.43
	p	<.001

All the factors examined are significantly correlated with purchase intention ($p < .001$) as indicated in the table. Subjective norms ($r = 0.38$), quality and functionality ($r = 0.49$), environmental concern ($r = 0.57$), price ($r = 0.63$), and non-availability ($r = 0.43$) show positive correlation with purchase intention, and higher value of these factors is associated with higher intention to purchase recycled products. The perceived risk, by contrast, has a negative correlation with purchase intention ($r = -0.39$), meaning that as perceived risk increases, purchase intention for recycled products decreases.

The subjective norms ($r = 0.38$), perceived risk ($r = -0.39$), and non-availability ($r = 0.43$) have weak to moderate relationships with purchase intention based on the size of the correlation coefficients. Quality and functionality are found to have a moderate positive correlation with the purchase intention, whereas environmental concern and the price are found to have the strongest positive correlation with the purchase intention. In all of the variables, price has the highest correlation with purchase intention, followed by environmental concern, which suggests that price and environmental concern are most related to consumers' purchase intention for recycled products. All relationships are significant at the 1% level ($p < .001$).

4. Discussion

The results show that among individuals who had previously purchased recycled products, generational differences were not significant for subjective norms, quality, price, and availability, suggesting that prior purchase experience may reduce generational differences for these factors. However, significant differences in perceived risk and environmental concern imply that generations differ in their level of risk sensitivity and environmental orientation, which are shaped by values and thought processes. Among non-buyers, there were no differences in subjective norms, perceived risk,

environmental concern, and availability, suggesting a more uniform perception across generations, possibly due to limited direct experience with recycled products. In contrast, price and quality differed significantly among generations, showing that first-time purchase decisions are more strongly influenced by practical considerations such as affordability and product quality, which vary across the three generations.

Subjective norms are higher among buyers because people who purchase recycled products are more influenced by approval from family, friends, or peers who value sustainable choices. This suggests social interaction helps convert positive environmental attitudes into actual buying behavior (Ramandini et al., 2025). Environmental concern is higher among buyers because these individuals are more aware of environmental problems and more willing to support products that reduce waste or conserve resources (Kim & Lee, 2023). Prices can be higher among buyers if they are more willing to pay extra for environmentally responsible products or if they perceive recycled products as worth the cost. Non-buyers may score lower because they are more price-sensitive and may think recycled products are not worth their money. Quality and functionality are higher among buyers because purchase experience often reduces doubts and increases trust in how well recycled products perform. Non-buyers may think recycled products are less durable or less effective, so they rate this variable lower due to uncertainty about the quality (Polyportis et al., 2022). Perceived risk is higher among non-buyers because they are more likely to worry about contamination, inferior quality, poor performance, or social embarrassment linked to recycled materials. Buyers usually have lower perceived risk because experience and familiarity reduce fear of negative outcomes. Non-availability is also higher among non-buyers due to lack of access, limited product range, or difficulty finding recycled products, which can stop people from purchasing them in the first place. Buyers may report lower non-availability because they are more motivated to search for these products or already know where to purchase them.

Subsequently, purchase intention of recycled products showed a positive relationship with subjective norms, quality and functionality, environmental concern, price, and non-availability, while it showed a negative relationship with perceived risk. This can be explained by the fact that people are more likely to intend to buy recycled products when they feel social support from others, believe the product will perform well, care more about the environment, and see the price as acceptable or worth paying for the benefits they receive (Dobbelstein & Lochner, 2023). Environmental concern and price usually show stronger relationships because they directly reflect a person's values and willingness to support sustainable products, so they have a more immediate effect on buying intention (Tudu & Mishra, 2021). Subjective norms and quality and functionality may show lower to moderate relationships because social influence and product performance matter, but they are not always the only factors shaping a final decision (Harjadi & Gunardi, 2022). Perceived risk shows a negative relationship because when people worry about poor quality, contamination, uncertainty, or waste of money, their intention to buy decreases (Zhuang et al., 2021). Non-availability can also relate to purchase intention because if recycled products are difficult to find, people may be less likely to buy them (Polyportis et al., 2022).

5. Conclusion

Recycled products are becoming an increasingly important part of everyday consumption and sustainable living. This study aims to examine consumers' attitudes toward recycled products across different generations. It also seeks to identify the norms influencing their willingness to purchase sustainable products, such as price, availability, environmental concern, quality, and perceived risk. The data for this study were collected through a structured survey created using Google Forms. The Likert scale was used, which gave options ranging from strongly agree to strongly disagree. ANOVA compares attitudes across the three generations, the t-test compares two groups (buyers and non-buyers), and correlation examines how factors like price and environmental concern are related to consumer attitudes toward recycled products.

The results of an independent t-test indicated that buyers had greater concern for subjective norms, environmental concern, price, quality, and functionality, while non-buyers reported higher perceived risk and non-availability. Moreover, the ANOVA results showed that among the people who have bought recycled products before, generational differences were not significant for subjective norms, quality, price, and availability, but they were significant for perceived risk and environmental concern. Among the non-buyers, most variables showed no generational differences, although price and quality varied significantly across the three generations. Finally, correlation values showed that purchase intention was positively related to subjective norms, quality and functionality, environmental concern, price, and non-availability. Contrarily, purchase intentions were negatively related to perceived risk, meaning that greater concern about risk reduces the intention to buy recycled products.

These results suggest that recycled-product buying depends on experience, social influence, environmental concern, and perceived risk and that these variables affect generations differently. The people who have bought recycled products before tend to feel more confident about quality, while non-buyers rely more on price and quality when deciding whether to purchase the products or not. The ANOVA results suggest that environmental concern and perceived risk vary more because they are linked to personal values and experience, while price and quality matter more for non-buyers who are still analysing the product. The t-test results show that buyers have stronger subjective norms, environmental concern, and trust in quality, whereas non-buyers feel more risk and non-availability of the products. The correlation results indicate that purchase intention increases with subjective norms, quality, environmental concern, and acceptable price but decreases when perceived risk is high.

6. Policy Implications

The results of this study indicate the need to develop strategies that encourage buying recycled products in order to consider different generational preferences and concerns. Public awareness campaigns should be designed to highlight environmental advantages of recycled products for environmentally aware consumers, as well as product quality, durability, and functionality for consumers who care more about product performance. This generation-specific communication can help to mitigate uncertainty, build consumer trust, and foster acceptance of recycled products. Further, consumer education through schools, universities, social media and public campaigns can help to overcome consumer misconceptions about the safety, quality and reliability of recycled products and boost consumer confidence.

Governments should adopt supportive fiscal and market-based policies to make recycled products more accessible and affordable, such as tax incentives, subsidies and financial support for manufacturers and retailers. These can help to keep recycled product prices lower in the market, decrease production costs, and encourage businesses to increase the offering of recycled products in various regions. Moreover, quality certification can be introduced, and eco-labeling can be encouraged to boost consumer confidence through product quality and to guarantee environmental compliance. These policy measures combined can help to encourage sustainable consumption, boost recycled penetration and support a more sustainable and circular economy.

7. Limitations

Despite useful insights from the study, there still remain some gaps. While this was a pan-India study, it may lack representativeness for the full diversity of social, economic and cultural life in India. The sample of respondents included people across the country, but the representation of smaller regional communities and rural populations is limited. The results may not reflect regional differences in cultural practices, income, product awareness, and availability of recycled products. Therefore, care should be taken in interpreting the results with generalizations in the Indian population.

Another constraint is the use of self-reported survey data gathered using an online questionnaire offered via Google Forms. The findings are based on the self-reported responses of the participants, which may introduce a number of biases such as social desirability bias and exaggeration of environmentally responsible attitudes. In addition, the study has a cross-sectional research design, where data are gathered from one point in time. Therefore, it only records the consumers' current perceptions and intent to buy and not the changing perceptions and intentions over time. Also, because of the cross-sectional design of the study, it is not possible to claim causal relationships between the various variables. Future studies could use longitudinal designs and behavioural purchase data, and larger and more representative samples, to increase generalizability and robustness of the results.

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