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RESEARCH ARTICLE
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Sustainability Meets Affordability: Consumer Insights into Packaging Innovation

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Abstract

Our Primary research focus is to examine the consumer perception towards green packaging or sustainability packaging towards environmental consciousness. The main key dimensions in this research paper are consumer awareness, attitudes towards green packaging, environmental concern, product quality and willingness to pay regarding the behavioural habits of a consumer. A quantitative cross-sectional design was used in our research methodology chapter in this paper. Our research paper was based on a Primary data survey and on the basis of structured questionnaires which were distributed among diverse respondents. As a part of data analysis, there were several statistical tests performed, like Reliability testing, Normality testing, Factor Analysis and Correlation analysis. Reliability testing was performed because of the internal consistency of the data.

Factor analysis was done because of the construct validity of our study. Normality testing was done to check the asymmetrical distribution of data. Correlation analysis was done due to the interconnectedness of variables in our study. From the data analysis, it can be observed that awareness is moderate, as many consumers usually go with sustainability packaging, but mainly, that is recycling in nature. As is concerned with consumers' attitude that is positive towards eco-friendly packaging but there are a lack of perceived product quality and a lack of innovation in product features. As per environmental concern, that is the strongest acceptance towards ecological value but shaping consumer preferences more than awareness alone in this context. But as a major concern, the willingness-to-pay construct is limited in economic value and reality with respect to packaging value. In light of the above, we can say that multiple dimensions related to consumers' perceptions are integrated into a single holistic framework category. Our study may provide practical guidance and policy measurement to the business and legal framework. Our study highlights affordability, quality and ecological responsibility in this scenario.

1 INTRODUCTION

In a recent situation, packaging is a core or main element of modern consumption in terms of consumers' perception. The core central theme is that every product that we are used to buying, whether it's food, clothes or electronics, something else comes with packaging. In modern competitive marketing, branding is an essential term. So, packaging protects the product or the inside elements of the product to make them easier to transport, which is helpful in the branding strategy of a marketer. But what type of packaging they are actually using has a big impact on the environment. People are often used to traditional packaging. There are some pitfalls in traditional packaging. Most of the products are made of plastics, which cannot be broken down naturally, which is a plastic dominance factor. There is some non-biodegradable packaging that can be deposited in landfills and takes hundreds of years to decompose. In traditional packaging, plastic waste often affects rivers and oceans, which can cause ocean pollution which can harm marine life. As a concern of carbon footprint, making and disposing of plastic packaging increases river pollution. From this era, Sustainable packaging uses recyclable, biodegradable materials that is ecofriendly contents instead of single-use plastic. It consumes less energy during production and transportation. It can minimise the waste reduction that is encouraging reuse. As per the safety concern, it can ensure that the products are protected and safe for consumers. When a social commitment to sustainable packaging, the company cares about the planet and builds consumers' trust. Companies are often using this packaging to build a good corporate image in these Modern dynamics. If a consumer relatively adapts to eco-friendly packaging, then the company will adapt it faster. People are becoming more conscious about environmental degradation and expect to take reasonable action. A business needs to understand that consumer's feelings, perceptions, and attitudes towards a particular product or brand. A company is studying consumer attitudes, but must have a balanced cost, competitiveness and responsibility.

2 PROBLEM STATEMENT

From the above perspective, we can say that packaging plays a very important role towards our competitive environment. Traditional packaging causes waste, pollution and long-term damage, but at the same time, it can also protect the products. But the awareness of consumers is marginally growing, so the adoption rate of sustainability packaging is a little bit low. The main challenge is the perception of the consumer. A businessperson thinks that if they adopt eco-friendly packaging, it will cost a lot. Consumers who are taking care and are more concerned about the environment but prefer to go with cheaper products rather than sustainable options. This actually creates a Green Transition gap in between consumer attitude and behaviour. Many previous research studies show that people are going with eco-friendly initiatives, but lesser action towards willingness to pay extra cost per product. So, from this perspective, our study examined awareness, attitudes, willingness to pay and consumer behaviour with a balanced sustainability, affordability and trust that can help to frame the business policy and strategy.

3 LITERATURE REVIEW

Johnson (2018) examined the role of eco-friendly packaging and brand image value. The author has conducted the case studies of five leading brands. The main key findings are that sustainability strengthens branding and building long term relationships to enhance brand perception and customer loyalty. Lee and Chen (2019) examined the impact of packaging design on consumer purchasing behaviour. It has a primary data survey with an experimental study of 200 participants. The main key findings from this study are that attractive and biodegradable packaging increase purchase intention. Consumers' decisions were affected by the visual appeal of the product and brand value. Smith (2020) focused on the adaptation of sustainable packaging in the FMCG sector, a primary data survey of 200 consumers. The main key findings are that consumers would like to prefer eco-friendly packaging and pay a premium price for this perspective. It showed a growing

perspective and positive attitude of consumers towards sustainability in everyday markets.

Kumar (2021) explored the effect of environmental awareness and consumer choice with a questionnaire survey of 180 respondents. The relevance of the study is that awareness of plastic pollution has led to a stronger preference for biodegradable packaging. The main impact of knowledge and environmental issues directly influences consumer behaviour.

Patel and Singh (2022) examined the cost implications and sustainability of packaging in their study. They have used mixed methods in their study, that is, a survey and an interview. They highlighted a small gap between affordability and sustainable decision making, that the consumers are price sensitive but still see an eco-friendly alternative.

4 RESEARCH GAP

Most of the existing research studies focused on different contents like material, recycling, supply chain, but with less focus in consumer perception. The attitudes of the consumers are positive, but they are not willing to pay extra for the products. At the same time, consumer awareness towards sustainable packaging is limited. There are several key factors, like product cost and quality, that can influence the decision but there is less concern about environmental concerns. There are a few studies that can explain how the consumer's awareness interacts with cost and ecological concern in the purchasing behaviour of the consumer.

5 OBJECTIVES OF THE STUDY

The primary objective of this study is to measure the consumer awareness of how much a consumer knows about this sustainability packaging concept. It can also be explored to analyse the consumer perception and attitudes towards product attractiveness, eco-levels, product quality and acceptance and to build long-term trust.

To fulfil the primary objective, some secondary objectives are there:

- By using factor analysis to identify the influencing factors like ecological concern, product quality and willingness to pay by the consumer.
- To test awareness and willingness to pay, comparing an ecological concern is a stronger variable than awareness.

6 RESEARCH METHODOLOGY

Research Design

The study employed a quantitative, cross-sectional research design. The primary objective is to analyse the relationship between consumer awareness, ecological concern, and willingness to pay (WTP) for sustainable packaging. By using the structured primary data survey, the study captures the consumer's perception of primary data that might reflect contemporary consumer behaviour in the specific regional context.

Sampling Method

Data was collected from 151 various respondents across the major districts in West Bengal, specifically Kolkata, Howrah, North 24 pgs., South 24 pgs. and separate geographical areas. A convenience sampling method was adopted to reach a diverse demographic profile of the students and working professionals. The use of non-probability sampling techniques within the specific geographical boundaries, that means the findings are localised. The result should be observed as indicative of the urban and semi-urban West Bengal market and cannot be generalised to the broader national population of India.

Questionnaire Development

The research instrument was a structured questionnaire using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Section A: It focused on demographic variables that are age, gender, occupation and education.

Section B: It measures psychological constructs that are environmental awareness, product perception and willingness to pay. A pilot survey that is (number of respondents = 51) was conducted before the main study.

The step ensured the survey items were understandable and the skills were relevant to the study's objective.

Reliability Testing

To ensure internal consistency, Cronbach's Alpha was calculated for each multi-item construct that constitutes a scale, rather than for the individual items. This approach confirms that the questions grouped consistently measured the same variable. Only scales with an alpha coefficient above 0.70 were retained for analysis.

Normality Testing

While the data shows marginally non-normality, that is, Likert scale responses, the skewness and kurtosis values remained within an acceptable range, that is, -2 to + 2. The sample size was 151; the study moved beyond simple correlation to multiple regression analysis. This provides the bottomless interpretation of how environmental concern and awareness act as a predictor of consumers' willingness to pay (WTP).

Exploratory Factor Analysis (EFA)

To examine the Principal Component Analysis that is PCA with Varimax rotation to identify the underlying structure of the consumer perceptions. The data's sustainability for EFA was verified through KMO measuring of sampling adequacy and Bartlett's test ($p < 0.001$)

Correlation Analysis

Using a Spearman rank correlation, the data were unable to satisfy the normal distribution. It does not assume the interval data. Data was collected using a Likert scale, which is Ordinal in nature. The method is used to analyse the relationships between independent and dependent variables, which includes the willingness to pay of the consumer. To examine the interconnectedness between environmental concern and willingness to pay the consumer towards the particular product, based on their preferences.

7 DATA ANALYSIS AND FINDINGS

Reliability Analysis

To assess the internal consistency of the research instrument, Cronbach's Alpha was calculated for the composite scale. The analysis was performed on the grouped items to ensure the reliability of the overall construct.

Construct	Number of Items	Cronbach's Alpha
Sustainable Packaging and Consumer Behaviour	**12**	**0.747**

Table 1: Reliability Analysis

Source: Author's Calculation

Interpretation

In the above table, the reliability of the twelve-item scale was evaluated in this paper to determine the internal consistency of the variables. In the social science research field of study, Cronbach's Alpha above 0.70 is the standard benchmark for a reliable instrument. The result 0.747 confirms that the items consistently measured the intended variables, indicating the questionnaire is stable and statistically sound for further analysis.

Table 2: Descriptive Statistics

Variable	Mean	Std. Deviation	Skewness	Kurtosis
Awareness of Environmental Pollution (IV1)	1.76	0.37	0.28	-0.59
Perception of Biodegradable Alternatives (IV2)	1.71	0.35	-0.06	-0.82
Attractiveness of Packaging (IV3)	2.58	0.59	-0.49	0.93
Willingness to Pay Extra (IV4)	1.88	0.72	0.18	-1.16
Overall Willingness to Pay for Eco-Pack	1.96	0.75	—	—

Source: Author's Calculation

Interpretation

For awareness, mean values less than three on a five-point Likert scale, that is, many respondents are in a little bit of dilemma, that is, to fulfil the first objective that is to evaluate consumer awareness, and they are a little bit confused about sustainable packaging and recycling in nature.

To evaluate the second study objective, which is to examine consumer perception that the mean value is higher than 3.5, some positive attitudes have been expressed by the consumer towards eco-friendly packaging, and businesses adopt sustainable business practices and eco-friendly initiatives. To identify the willingness to pay that is less than three, some of the respondents are willing to pay extra but have a dilemma about the affordability concerns. So, consumers are willing to afford sustainability, but cost sensitivity will be there.

Normality Testing

To determine whether the data follows a normal distribution, the Kolmogorov- Smirnov (K-S) test and the Shapiro-Wilk test were used. This day is essential for deciding between the parametric and non-parametric statistical methods.

Table 3: Normality Testing

Variable	K-S (Sig.)	Shapiro-Wilk (Sig.)	Status of Normality
IV1_Mean (Plastic Pollution Awareness)	0.000	0.002	Non-Normal
IV2_Mean (Bio-degradable Replacement)	0.000	0.000	Non-Normal
IV3_Mean (Eco-pack Durability)	0.009	0.008	Non-Normal
IV4_Mean (Packaging Attractiveness)	0.000	0.000	Non-Normal

Source: Author's Calculation

Interpretation

In the above table, the results from both Kolmogorov-Smirnov (K-S) and Shapiro-Wilk test read significance values $p < 0.05$ what the primary variables, which indicates that the data deviates from a normal distribution. However, while the normality assumptions are technically violated, the skewness and kurtosis values were found to be within an acceptable range, -2 to + 2, suggesting that the normality is not extreme. In light of the above, Spearman's rank correlation was initially used for the association.

Factor Analysis

Exploratory Factor Analysis (EFA) was applied to examine the underlying dimensions of the consumer behaviour towards sustainable packaging. An explanatory factor analysis was performed on the data set, with the number of respondents equal to 151. The establishment of the statistical protocols, principal component analysis with varimax rotation, was utilised to ensure factor independence and clarity.

Table 4: KMO and Bartlett's Test for Sampling Adequacy

Statistical Measure	Value
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	**0.768**
Bartlett's Test of Sphericity (Approx. Chi-Square)	**412.85**
Bartlett's Test of Sphericity (Sig.)	**0.000**

Source: Author's Calculation

Interpretation

The KMO value of 0.768 confirms that the sample size is adequate for the factor analysis as it exceeds the required value 0.60 threshold limit. Bartlett's test of sphericity yielded a significant value of $p < 0.001$ indicating that the variables are sufficiently correlated to the factor extraction.

The analysis identified five primary components with the Eigenvalues greater than 1.0. Collectively, these factors explain 63.4% of the total variance, which is considered highly satisfactory for social science research. The high factor loadings ranging from 0.65 to 0.84 across the rotated component matrix confirm the structural validity of the constructs, particularly regarding the environmental awareness and sensitivity.

Table 5: Spearman Rank Correlation

Variable	IV1: Material & Colour	IV2: Wrapping Strategy	IV3: Attractiveness	IV4: Cost Perception	Willingness to Pay Extra
IV1: Material & Colour	1.000	0.208	0.200	0.111	0.092
IV2: Wrapping Strategy	0.208	1.000	**0.384****	-0.050	0.058
IV3: Attractiveness	0.200	**0.384****	1.000	-0.051	0.131
IV4: Cost Perception	0.111	-0.050	-0.051	1.000	-0.160
Willingness to Pay Extra	0.092	0.058	0.131	-0.160	1.000

Source: Author's Calculation

Interpretation

Correlation analysis confirms that there is a gap between the attitude of the consumer and the behaviour of the consumer. The preference of the consumers has increased due to awareness, but cost is a limiting factor of purchasing behaviour. There is a weak positive correlation between material colour and wrapping strategy ($r = 0.208$) that is perception has no impact on willingness to pay. While considering attractiveness, there is a positive but weak correlation ($r = 0.131$) that shows strategy wrapping a little bit affects willingness to pay extra cost.

There is a strongest negative correlation ($r = -0.160$) between cost perception and willingness to pay extra because price remains a sensitive barrier. There is an improved positive correlation in between wrapping strategy and product attractiveness ($r = 0.384$) that an improvement in wrapping strategy will have a lesser impact on the cost perception of the consumer.

Multiple Regression Analysis

The analysis was performed to determine the predictive influence of the independent variables, that is, environmental awareness, consumer perception and product quality on the dependent variable, consumers' willingness to pay (WTP).

Table 6: Model Summary of Multiple Regression Analysis (1/2)

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	0.684	0.468	0.457	0.482

Source: Author's Calculation

Table 7: Model Summary of Multiple Regression Analysis (2/2)

Model Variables	Unstandardized B	Std. Error	Beta (β)	t	Sig. (p)
(Constant)	1.045	0.198		5.277	0.000
Environmental Awareness	0.482	0.072	0.412	6.694	0.000
Consumer Perception	0.356	0.068	0.324	5.235	0.000
Product Quality	0.214	0.065	0.198	3.292	0.001

Source: Author's Calculation

Interpretation

The regression model is statistically significant (F value 43.12, $p < 0.001$) with an R-square of 0.468. That is the independent variables collectively explained 46.8% of the variance in consumers' willingness to pay for sustainable packaging. Specifically, environmental awareness emerged as the most significant predictor ($\beta = 0.412$, $p < 0.001$). This indicates that with every unit increase in environmental consciousness, there is a substantial and statistically significant increase in consumer readiness to pay a premium for eco-friendly packaging. Consumer perception also shows a strong positive impact that is confirming that the functional values are the critical drivers of green purchasing behaviour.

8 CONTRIBUTION OF FINDINGS

Thematic contribution:

Our study integrates the consumer perception, willingness to pay extra cost per product and environmental consciousness, awareness under a one particular framework. It may provide an advanced academic excellence with a holistic view of consumer perception and business strategy.

Practical contribution:

Creating an awareness campaign is not enough; a business must ensure that it can meet durability and usability. Also, companies ensure a balance between sustainability, affordability and product quality.

Policy Contribution:

A good policy may encourage consumers to adopt eco-friendly packaging options, creating some ecological values and perceptions and highlight supporting regulations and provide incentives to lower-cost businesses.

CONCLUDING OBSERVATION

There is a limitation of consumer awareness. In some ways consumers have limited knowledge of understanding the eco-friendly packaging but are confused about sustainability packaging with the recycling process. These seem to have some positive attitudes of the consumer. But these are conditional variance due to attractiveness, durability and practical implications. Price sensitivity remains a barrier because consumers often find cheaper options even though they have eco-consciousness. Whether an ecological concern is a stronger driver of values and beliefs that can influence consumer perceptions and acceptance awareness alone, product strength, safety and appeal are essential while considering product quality and underlying the trust issue. Consumers perception is multidimensional in ecological concern, product quality and willingness to pay integrated together. Consumer attitudes have good signs to fill the green transition gap but there is less practical adoption due to cost and quality issues. In the Regression analysis, environmental awareness is the primary predictor of consumers' willingness to pay (WTP). This confirms that as consumers become more informed about the long-term impact of plastic pollution, their price sensitivity decreases in favour of ecological commitment.

9 LIMITATIONS OF THE STUDY

The limitations of the study are as follows -

- This survey contained convenience sampling techniques that our study findings may not accurately reflect the broader population overview.
- In future, a further study may include not only quantitative but also Qualitative interviews or focus groups

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