

Impact On Environment W.R.T Secondary Packaging On Consumers: An Empirical Study

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Abstract:

This empirical study examines the environmental impact of secondary packaging from the consumer's perspective, focusing on awareness, behaviour, and purchasing decisions. Secondary packaging, often used for protection, branding, and display, contributes significantly to environmental waste and carbon footprint. Data were collected through surveys and questionnaire with 169 consumers across urban environments, the study explores consumer perceptions regarding eco-friendliness, recyclability, and necessity of such secondary packaging. Results indicate that while many consumers express concern about environmental issues, their purchasing decisions are still largely influenced by aesthetic and functional aspects of packaging. The study also reveals a knowledge gap concerning sustainable packaging options and recycling practices, the findings underscore the need for increased consumer education about benefits of product without secondary packaging, transparent labelling, and industry-level shifts toward minimal and recyclable packaging. This research offers valuable insights for consumer and impact of environment with secondary packaging. Recommendations include adopting eco-friendly materials, redesigning packaging for minimalism, and increasing public awareness to reduce environmental harm.

Keywords: Secondary Packaging, Environment, Sustainable

INTRODUCTION:

In 21st century Packaging is now generally regarded as an essential component of our modern lifestyle and with help of packaging the business is organized. Packaging is the enclosing of a physical object, typically a product that will be offered for sale. It is the process of preparing items of equipment for transportation and storage and which embraces preservation, identification and packaging of products. Packing is recognized as an integral part of modern marketing operation, which embraces all phases of activities involved in the transfer of goods and services from the manufacturer to the consumer.

Now a days Packaging or secondary packaging is an important part of the branding process as it plays a role in communicating the image and identity of a company, which signifies the brand of the company. There are three types of packaging classified as primary packaging, secondary packaging and tertiary packaging.

Secondary packaging is the outer layer of packaging that encloses and protects the primary packaging, bundling products for easier handling, storage, and transportation. The purpose of secondary packaging provides an additional layer of protection to the primary packaging and the product itself, safeguarding against damage during handling and storage. For transportation secondary packaging facilitates efficient transportation and storage by allowing for stacking, palletizing, and easy handling of multiple units. Secondary packaging is also used as marketing and branding tool, as it can be used to display brand information, logos, making it an important tool for brand visibility.

Secondary packaging is made up of different materials like cardboard box, paperboard, plastic films, carton and trays. Cardboard boxes used to contain multiple individual items, plastic films are used as shrink wrap to various primary packaging and Trays can be used to hold and organize products.

Furthermore, secondary packaging is classified in two different types which are rigid and non-rigid type. Rigid secondary packaging are cardboard boxes, crates, rigid plastic containers, which are made up of Cardboard, corrugated fibreboard, plastic. Non rigid secondary packaging are Shrink wrap, bags, pouches, bubble wrap, packing paper, which are made up of Plastic films, paper, foil. We have seen secondary packaging in most of the cases is one time packaging, which has to be removed while using the product. As a result, secondary packaging is thrown in garbage and there is no recycle or reuse of secondary packaging, which adversely affect the environment.

As secondary packaging often made of cardboard, plastic, or other materials, contributes significantly to overall packaging waste, which are produced from non-renewable resources contributes to resource

depletion. Non-recyclable or poorly managed packaging materials end up in landfills, causing pollution and releasing harmful substances.

So, there must be sustainable secondary packaging is to be produced and used in the packaging industry, which are made from recycled materials, Biodegradable and Compostable Materials. By using these type of materials in secondary packaging ensures that packaging decomposes naturally, minimizing environmental impact.

LITERATURE REVIEW:

The packaging is the first component of the promotion. Package design plays a vital role in marketing. Adequate packaging will attract a lot of consumers' attention. This may lead to increase consumers' intentions on buying products (Shruti, C., 2014).

Now a days secondary packaging is made up of cardboard boxes and plastic films which leads to environmental pollution. The impact of secondary packaging on environment are:

- a. *Resource Consumption*: Secondary packaging often utilizes materials like corrugated cardboard, plastic films, and shrink wraps. The production of these materials consumes natural resources—paperboard requires wood pulp, while plastics are derived from fossil fuels (Marsh, K., & Bugusu, B., 2007). Even though many secondary packaging materials are recyclable, the extraction and manufacturing processes are resource-intensive.
- b. *Waste Generation*: One of the primary concerns is the volume of waste produced. According to the U.S. Environmental Protection Agency (EPA, 2021), packaging accounts for about 28% of municipal solid waste, with secondary packaging making up a large portion due to commercial logistics.
- c. *Carbon Footprint*: The production, transportation, and disposal of secondary packaging contribute to greenhouse gas emissions. Life cycle assessments (LCAs) indicate that transportation and excessive packaging layers significantly increase the carbon footprint (Rossi, S., et al., 2012). For instance, excessive use of plastic films or multi-layered materials complicates recycling and raises emissions during disposal.
- d. *Recycling Challenges*: While secondary packaging is often designed to be recyclable, in practice, contamination (e.g., mixed materials, food residue) and lack of infrastructure limit actual recycling rates (Hopewell, J., Dvorak, R., & Kosior, E., 2009). Laminated or coated packaging, often used for moisture or strength, further complicates the recycling process.

Sustainable alternatives and innovations in packaging are:

- a. *Eco-Design and Minimalist Packaging*: Companies are increasingly adopting sustainable design practices, such as using biodegradable materials or reducing packaging weight and volume. This not only reduces environmental impact but can also lower costs (Lewis, H., 2012).
- b. *Reusable and Returnable Packaging*: Some industries are transitioning to reusable secondary packaging systems—like reusable plastic totes in retail supply chains—which reduce single-use waste and total carbon emissions (Lindhqvist, T., 2000).
- c. *Regulation and Consumer Pressure*: Policies such as the EU Packaging Waste Directive and growing consumer awareness are pushing brands toward environmentally friendly packaging solutions. Extended Producer Responsibility (EPR) is encouraging companies to consider packaging end-of-life in their designs (OECD., 2016).

METHODOLOGY:

Quantifying qualitative things is a challenging task. However, the paper aims to understand the consumer awareness in secondary packaging on environment. With the help of primary data collection, the research is trying to explore the concepts and various factors impacting the same.

Sampling:

The research was conducted on a sample of 169 respondents using questionnaires. Following is the descriptive information about respondents. The sample structure is shown below:

Characteristics	Share in the Sample	Results
Age	18-30 Years	40.2%
	31-40 Years	24.3%
	41-50 Years	20.7%

	51&above	14.8%
Education	ISCED 4 or less*	10.1%
	ISCED 5 and 6*	65.6%
	ISCED 7 or More*	24.3%
Gender	Female	45%
	Male	55%
Income**	Below 50,000	31.4%
	51,000-75,000	18.9%
	76,000-1 Lakh	21.9%
	1 Lakh & Above	27.8%

* ISCED = International Standard Classification of Education. ISCED 4 or less is roughly equivalent up to post-secondary non-tertiary education. ISCED 5 and 6 are equivalent to short-cycle tertiary education and bachelor or equivalent. ISCED 7 or more represents a master or doctoral. ** Income is in Indian Rupees (₹).

Data Collection:

The study was conducted through a questionnaire. The responses were collected through a 5-point scale, known as the Likert scale. They are using a 5 point Likert scale with consist of five points strongly agree to strongly disagree, with neutral as a middle point. This is done in order to extract a specific response from the respondents.

Analysis:

Two statements were drafted for impact on environment with secondary packaging. Both the two statements were drafted to identify the impact on environment. All the statements were adopted from various research papers.

The researcher has used the t-test as a t-test is a type of inferential statistic used to determine if there is a significant difference between the two groups' means. Here the grouping is as per age, gender, and income. The research is trying to explore whether impact on environment with secondary packaging on consumers vary with the demographical factors?

In the case of more than two groups, the analysis of Variance (ANOVA) is used. It is used to analyse the differences among a group of means in the responses. The One-Way Analysis of Variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of dependent and independent groups.

RESULTS AND DISCUSSION:

H₀₁: There is significant impact on environment with secondary packaging among males and females

H₁₁: There is no significant impact on environment with secondary packaging among males and females

t-Test: Paired Two Sample for Means		
	Impact on Environment	Gender
Mean	2.973372781	1.550295858
Variance	1.221012961	0.248943364
Observations	169	169
Pearson Correlation	-0.016450187	
Hypothesized Mean Difference	0	
df	168	
t Stat	15.16548713	
P(T<=t) one-tail	1.38477E-33	
t Critical one-tail	1.653974208	
P(T<=t) two-tail	2.76954E-33	
t Critical two-tail	1.974185191	

The above table represents the t-test of gender and impact on environment with secondary packaging by males and females with the mean, variance, t-stat, p-value. The number of observations in each variable is 169. We can see the $p\text{-value} < \alpha$ ($\alpha=0.05$, i.e., 5% probability) in the above table. So, the p-value of two-tail $2.76954E-33 < 0.05$. So, we can say that the null hypothesis is rejected.

Inference: The relationship between both the values is $t\text{-stat} > t\text{-critical}$. So, we can again say that the null hypothesis can be rejected. It shows the impact on environment with secondary packaging is unbiased to any gender.

H_{02} : There is a significant impact on environment with secondary packaging among various education level

H_{22} : There is no significant impact on environment with secondary packaging among various education level

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Education	169	462	2.7337278	0.8870104		
Impact on Environment	169	502.5	2.9733727	1.2210129		
ANOVA						
Source of Variation	SS	df	MS	F	Pvalue	F crit
Between Groups	4.8528106	1	4.8528106	4.6041335	0.0326110	3.8692832
	51		51	98	67	79
Within Groups	354.14792	336	1.0540116			
	9		93			
Total	359.00073	337				
	96					

The above table represents the Anova, single factor of age, and impact on environment with secondary packaging with average, variance, f-crit, p-value. The number of observations in each variable is 169. From the above test we can observe that the $p\text{-value} = 0.032611067$ i.e. $p\text{-value} < \alpha$ ($\alpha=0.05$ i.e. 5% probability). So, we can reject the null hypothesis considering the relationship between p-value and α .

Inference: The relationship between both the values are $F > F\text{-crit}$. So, we can again reject the null hypothesis. The result shows there is no impact on environment with secondary packaging as per different education groups.

H_{03} : There is a significant impact on environment with secondary packaging among various age groups

H_{33} : There is no significant impact on environment with secondary packaging among various age groups

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
Age	169	355	2.10059171	1.19815441		
Impact on Environment	169	502.5	2.97337278	1.22101296		

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	64.36760355	1	64.36760355	53.21467569	2.16756E-12	3.869283279
Within Groups	406.4201183	336	1.209583686			
Total	470.7877219	337				

The above table represents the ANOVA: single factor of age and impact on environment with secondary packaging with average, variance, f-crit, p-value. The number of observations in each variable is 169. From the above test we can observe that the p-value= 2.16756E-12 i.e. p-value< α ($\alpha=0.05$ i.e. 5% probability). So, we can reject the null hypothesis considering the relationship between p-value and α .

Inference: The relationship between both the values are $F > F_{\text{crit}}$. So, we can again reject the null hypothesis. The results show impact on environment with secondary packaging does not impact with age.

H₀₄: There is a significant impact on environment with secondary packaging amongst various income groups.

H₄₄: There is no significant impact on environment with secondary packaging amongst various income groups.

Anova: Single Factor						
SUMMARY						
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Income	169	416	2.461538462	1.44047619		
Impact on Environment	169	502.5	2.973372781	1.221012961		
ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	22.13683432	1	22.13683432	16.63492358	5.66283E-05	3.869283279
Within Groups	447.1301775	336	1.330744576			
Total	469.2670118	337				

The above table represents the ANOVA: single factor of age and impact on environment with secondary packaging with average, variance, f-crit, p-value. The number of observations in each variable is 169. From the above test we can observe that the p-value= 5.66283E-05 i.e. p-value< α ($\alpha=0.05$ i.e. 5% probability). So, we can reject the null hypothesis considering the relationship between p-value and α .

Inference: The relationship between both the values are $F > F_{\text{crit}}$. So, we can again reject the null hypothesis. It shows that the impact on environment with secondary packaging does not vary because of income. The higher income group of people and a lower-income group of people have an equal mean.

CONCLUSION:

The study highlights a growing awareness among consumers regarding the environmental impact of secondary packaging; however, this awareness does not consistently translate into environmentally conscious purchasing behaviour. While secondary packaging plays a key role in product appeal and protection, but it often leads to unnecessary waste and environmental burden due to non-recyclable, non-reusable or excessive materials. The findings suggest that consumers are more willing to purchase product without packaging and encourage to be more environmentally friendly. To bridge this gap, organisation and policymakers must work towards enhancing consumer education, promoting sustainable packaging alternatives, and implementing clear labelling systems that encourage eco-friendly choices. A collaborative effort between industry, consumers, and regulators is essential to reduce the environmental footprint of packaging and promote responsible consumption practices. In study, it found that consumers with different demography doesn't have any significant impact on environment with secondary packaging.

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