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Consumer Perception Towards Sustainable Packaging in E-Commerce Industry: A Factor Analytic Approach

Dr. C. Sunita ⋆

Assistant Professor, PG & Research Department of Economics, Ethiraj College for Women, Chennai, TN, IND.

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ABSTRACT

Sustainable packaging is an eco-friendly alternative to traditional plastic packaging that reduces carbon footprint and promotes human and ecological longevity. As the green supply chain concept gains popularity, companies worldwide are embracing sustainable and environmentally friendly packaging practices. According to the Sustainability Annual Trends report, e-commerce platforms are experiencing substantial growth and having an enormous environmental impact. The e-commerce industry's rapid expansion has significant environmental consequences because the majority of products sold on these platforms are packaged in harmful plastic materials that are detrimental to the ecosystem. The supply chain network's devastating effect on the environment has forced e-commerce companies to re-evaluate their strategies and adopt sustainable policies that prioritize eco-friendly packaging. As a result, e-commerce companies are seeking alternatives to traditional plastic packaging to minimize their environmental impact. This shift towards sustainable practices will help reduce the industry's negative environmental impact, which has been a significant concern in recent years. The objective of this study is to investigate consumer perceptions of sustainable packaging in e-commerce platforms. The study will use the Factor Analytic Approach to identify the critical factors that influence consumers' attitudes towards sustainable packaging. Additionally, this study will offer recommendations on sustainable packaging solutions that e-commerce companies can adopt to reduce their environmental impact. By analysing consumer perceptions of sustainable packaging, this study will help e-commerce companies understand the factors that affect their customers' decision-making processes when it comes to eco-friendly packaging. As a result, e-commerce companies can take steps to adopt sustainable packaging practices that align with consumer preferences, reduce their environmental footprint, and promote their brand's commitment to sustainability.

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⋆ *Corresponding author's e-mail:* sunita@ethirajcollege.edu.in (Dr. C. Sunita)

1.0 INTRODUCTION

Sustainable packaging is a practice that mainly focuses on utilizing eco-friendly and recyclable materials. It is commonly known as green packaging, and its aim is to reduce energy consumption and mitigate negative impacts on the environment. As the concept of green supply chain gains attention, companies worldwide are adopting sustainable and environmentally friendly packaging practices. According to the Sustainability Annual Trends report, the e-commerce industry is experiencing significant growth, which has resulted in a considerable environmental impact.

In 2021, the Indian e-commerce market was valued at US$ 41.34 billion, and it is estimated to surpass US$ 50 billion by 2025, as per ASSOCHAM. This significant growth can be attributed to the increasing rate of internet penetration in India, coupled with robust GDP growth and rising purchasing power of consumers. As a result, India is poised to become the world's fastest-growing market for e-commerce, which in turn, will contribute to the growth of the e-commerce packaging industry in the region.

The e-commerce packaging market in India experienced a significant growth, from USD 13.8 million in 2020 to an expected USD 1109.26 million by 2026, with a compound annual growth rate (CAGR) of 13.8% during the period 2021-2026. The surge in demand for e-commerce packaging can be attributed to the country's growing population, higher income levels, lifestyle changes, and a rapidly expanding economy, according to a report by Mordor Intelligence. However, the packaging materials currently used in the industry are predominantly harmful plastic, which negatively affects the environment. Therefore, utilizing sustainable packaging materials for e-commerce products can potentially offer a solution to this issue.

1.1 Review of Literature

In a study conducted by Mekonnen *et al.,* (2021), the researchers aimed to examine how sustainable packaging influences consumer purchase intentions in the context of online shopping. The study explored various factors, including environmental concern, the perceived usefulness of sustainable packaging, and the perceived credibility of sustainable packaging claims, in shaping consumer purchase intentions.

Another study by Norazah *et al.,* (2020) sought to understand the relationship between green packaging attributes and consumers' intentions to purchase products in an online setting. The authors specifically investigated the impact of different green packaging attributes, such as recyclability, material sourcing, and eco-labelling, on consumers' intentions to buy products online.

Furthermore, Gil-Saura *et al.,* (2021) conducted a study that focused on the effect of sustainable packaging on perceived value, customer satisfaction, and repurchase intention. The researchers analysed how perceived value and customer satisfaction mediate the relationship between sustainable packaging and consumers' intentions to repurchase products in the e-commerce context.

Sustainable and eco-friendly packaging is becoming increasingly important for e-commerce companies, as they seek to improve their image and reduce their impact on the environment. This trend is expected to continue in the future, with a growing emphasis on the use of recyclable plastics.

1.2 Research Gap

Due to the increasing popularity of the green supply chain concept, companies around the globe are now willing to adopt sustainable and eco-friendly packaging practices. However, the e-

commerce industry, which is growing rapidly, has a significant negative impact on the environment as most of the products sold through these platforms are packed in plastic materials that can harm the ecology. This has prompted e-commerce companies to re-evaluate their strategies and embrace sustainable policies that involve the use of eco-friendly packaging materials.

1.3 Objectives of the Study

- To examine how consumers perceive sustainable packaging for products sold through e-commerce.
- To provide recommendations to e-commerce companies pertaining to sustainable packaging solutions

1.4 Hypothesis

- **H_1:** There are significant factors affecting consumer perceptions towards sustainable packaging.

2.0 RESEARCH METHODOLOGY

The study utilized exploratory factor analysis to investigate how consumers perceive sustainable packaging in e-commerce platforms. The aim was to identify significant factors that influence consumers' perceptions of sustainable packaging. The study collected primary data using a well-structured questionnaire from a sample of 100 respondents in Chennai. The questionnaire used a five-point Likert scale, ranging from strongly agree to strongly disagree, to measure consumer perceptions. The study analysed the factor loading to determine the significant factors affecting consumer perceptions towards sustainable packaging.

3.0 ANALYSIS AND DISCUSSION

3.1 Consumer Perception towards Sustainable Packaging

The aim of this study is to analyse the factors that influence consumer perception towards sustainable packaging. To achieve this, a factor analysis method was used, with a five-point Likert scale ranging from strongly agree to strongly disagree. The sample consisted of 100 respondents from Chennai, with a majority of them being female (52%) and aged between 20-30 years (56%). Of these respondents, 48% were graduates. The factor analysis was conducted using seven factors, including Protection, Promotion, Preference, Ethical, Awareness, Convenience, and Initiative. The study included 23 statements related to these factors.

3.2 Factor Analysis

To examine the factors that affect consumer perception towards sustainable packaging, explanatory factor analysis is used. The data is tested for reliability using Cronbach's Alpha reliability test, which ranges from 0 to 1, and a value greater than 0.6 indicates reliable results. The Cronbach's alpha value for this study is 0.841, which is significant and confirms the reliability of the data.

3.2.1 Bartlett's Test of Sphericity

This test provides information about the significance of the correlation matrix and the statistical probability of significant correlations among variables. (Hair *et al.,* 2007). It confirms the

validity of the factor analysis by testing the overall significance of the correlation matrix (*approx.* chi square = 635.580, significant at 0.000) and shows that the correlation coefficient matrix is not an identity matrix, indicating its suitability for conducting factor analysis.

3.2.2 Kaiser-Meyer-Oklin (KMO) Measure of Sampling Adequacy

The suitability of the data for factor analysis is assessed using the Kaiser-Meyer-Olkin (KMO) statistic, as shown in Table *1*. A KMO value ranging from 0.5 to 1.0 is considered adequate for factor analysis. In this study, the computed KMO value is 0.737, indicating that the data is appropriate for factor analysis. Furthermore, principal components analysis is used for factor extraction.

Table 1

Reliability Testing

Cronbach's Alpha, KMO and Bartlett's Test		
Cronbach's Alpha		0.841
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.737
Bartlett's Test of Sphericity	Approx. Chi-Square	635.580
	Significance	0.000

Source: Primary Data

3.2.3 Rotation Method

Varimax orthogonal rotation method is used to identify uncorrelated factors or dimensions. The latent root criterion is applied to extract significant factors, where factors with Eigen values greater than one are considered significant. In this study, there are seven factors with Eigen values greater than one, which are 5.255, 1.731, 1.627, 1.315, 1.176, 1.365, and 1.268, respectively. To assess the appropriateness of the total factor solution, the percentage of total variance is considered as an indicator, and in this study, the total solution index accounts for 60.326% of the total variation in the data, which is considered good for analysis.

3.2.4 Interpretation of Factors

The strength of the relationship between an original variable and its factor is represented by a factor loading. To determine the significance of factors, the study adopts the criterion suggested by Hair *et al.,* (1995), which takes into account the sample size. A factor loading of 0.5 or higher is considered significant for a sample size of 100. The 7 factors identified in the study are named appropriately, considering the variables they represent. Table 2 displays the rotated factor matrix where high factor loadings indicate a strong correlation between a variable and its factor. In factor 1, variables 5, 9, 10, 11, and 12 have factor loadings of .792, .632, .712, .787, and .682, respectively. These variables relate to the perception that eco-friendly packaging is as good as plastic, protects the product from contamination, can be reused multiple times, is made from green materials like recycled and biodegradable material, and is safe for human health. For factor 2, variables 2, 3, 19, 22, and 23 have high factor loadings of .511, .741, .582, .567, and .528, respectively. These variables relate to the perception that green packaging is attractive, can be identified by its colour, size, and shape, has green benefits mentioned on the packaging, is looked for first when purchasing green products, and is less harmful to the environment.

Factor 3 is composed of three variables, namely 4 (willingness to pay a small premium for products with sustainable packaging), 6 (belief that sustainable packaging reduces carbon footprint),

and 21 (preference for natural components such as biodegradable, recyclable, and renewable materials in packaging). These variables have loadings of .854, .536, and .554, respectively. Factor 4 is a combination of three variables, namely 14 (belief that the Indian government should have strict provisions to control packaging waste), 17 (belief that companies are responsible for the environment if they offer products with sustainable packaging), and 20 (belief that eco-designed packaged products create social value), with factor loadings of .544, .781, and .632, respectively. Factor 5 consists of two variables, namely 8 (belief that pollution from the manufacture of packaging contributes to global warming) and 18 (belief that sustainable packaging is an environmentally friendly option), with factor loadings of .768 and .567, respectively. Factor 6 is composed of three variables, namely 1 (belief that information on green packaging is easy to understand), 7 (belief that sustainable packaging involves using materials that are easier to recycle), and 13 (belief that eco-labels are trustworthy), with factor loadings of .628, .656, and .577, respectively. Finally, Factor 7 comprises two variables, namely 15 (belief that there should be more advertisements related to eco-friendly packaging) and 16 (belief that sustainable packaging awareness should be given priority), with factor loadings of .521 and .654, respectively.

Table 2

Rotated Component Matrix

	Component							Communalities
	1	*2*	*3*	*4*	*5*	*6*	*7*	
V1	-.081	.214	.281	.019	-.054	.628	.153	.561
V2	.395	.511	.064	.237	.235	.058	.187	.531
V3	.163	.741	-.028	-.155	-.272	.214	.167	.759
V4	.083	.022	.854	-.044	-.024	.061	-.014	.744
V5	.792	.288	-.113	.244	.063	.021	.025	.758
V6	.362	-.113	.536	.255	-.016	.437	-.084	.612
V7	.023	-.045	-.085	.022	.013	.656	-.085	.453
V8	.048	-.035	.016	-.118	.768	.037	-.153	.657
V9	.632	.026	.431	.052	.023	.131	-.021	.618
V10	.712	.127	.038	.081	-.153	.058	-.173	.613
V11	.787	-.047	.078	-.084	.145	-.054	.062	.682
V12	.682	.311	.191	.314	.211	-.042	.152	.731
V13	.142	.087	-.025	.152	.473	.577	.227	.557
V14	.235	.066	.238	.544	.267	.319	.011	.377
V15	-.023	-.026	.287	.285	-.125	-.387	.521	.568
V16	.042	.114	-.132	-.061	.061	.072	.654	.462
V17	.028	.050	.182	.781	.063	.125	-.164	.714
V18	.081	-.024	-.187	.377	.567	-.049	.212	.523
V19	-.044	.582	.285	-.062	.478	-.041	.136	.548
V20	.356	.033	-.254	.632	-.082	-.056	.131	.587
V21	.257	.242	.554	.258	-.032	-.213	-.331	.657
V22	.183	.567	.081	.237	.074	-.038	-.467	.674
V23	.385	.528	-.035	.252	.217	-.051	-.177	.492
Eigenvalues	5.255	1.731	1.627	1.315	1.176	1.365	1.268	
Percent of Variation	14.826	8.282	8.158	8.122	7.618	7.326	5.994	60.326
Cumulative percentage of variance	14.826	23.108	31.266	39.338	47.006	54.332	60.326	

Source: Primary Data

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 11 iterations

Table 3

Interpretation of Factors

Factor Names & Variance Explained		Statement	Factor Loadings
Protection (F1)	1.	Packaging made from green material like recycle and biodegradable material is good.	.787
	2.	Packaging made from eco-friendly material is as good as plastic one.	.792
	3.	After using original product, I reuse green packaging several times.	.712
	4.	I will purchase product with green packaging as it is safe for human health.	.682
	5.	Green packaging protects product from contamination.	.632
Promotion (F2)	1.	I identify green product by packaging colour, size, and shape	.741
	2.	I look for green label first when purchasing green product	.567
	3.	The product with green packaging is attractive	.511
	4.	I prefer products because of "green" benefits mentioned on packaging	.582
	5.	Green packaging is less harmful to environment	.528
Preference (F3)	1.	I prefer buying products with sustainable packaging for a small increase in cost	.854
	2.	I prefer to use natural components like Biodegradable, Recyclable, Renewable in packaging.	.554
	3.	Sustainable packaging reduces the carbon footprint	.536
Ethical (F4)	1.	The company is responsible towards the environment if it offers its products with sustainable packaging	.781
	2.	Eco-designed packaged product creates social value	.632
	3.	Indian Government should have strict provisions to control packaging waste.	.544
Awareness (F5)	1.	The production of packaging contributes to global warming through pollution.	.768
	2.	Sustainable Packaging is an environmentally friendly option	.567
Convenience (F6)	1.	The use of materials that are easier to recycle is involved in sustainable packaging.	.656
	2.	Information regarding to contents, instructions and benefit on green packaging are easy to understand	.628
	3.	Eco-label is trustworthy	.577
Initiative (F7)	1.	Sustainable packaging awareness must be given priority	.654
	2.	There should be more advertisements related to eco-friendly packaging.	.521

Source: Primary Data

Protection (F1)

According to the results presented in Table *2* and Table *3*, the factor labelled protection emerges as the most significant factor, explaining approximately 14.826% of the total variance. Based on the responses, it can be concluded that sustainable packaging plays a crucial role in ensuring the safety of the product by creating a healthy environment, which in turn prevents food contamination.

Promotion (F2)

Promotion is the second most significant factor, explaining 8.282 percent of the total variance. The respondents believed that sustainable packaging is beneficial as it utilizes recycled materials and minimizes resource waste during production. They also deemed the green label as a reliable emblem that manufacturers can use to advertise products that are genuinely more eco-friendly than their counterparts.

Preference (F3)

The third important factor that accounts for 8.158 percent of the total variance is the preference for sustainable packaging, which aims to prevent the escape of plastics or other materials into the natural environment. Additionally, the reuse of packaging extends its lifespan, reducing the need for new materials and ultimately contributing to a lower carbon footprint.

Ethical (F4)

This factor has 8.122 percent of variance explained. The research indicates that sustainable packaging promotes the conservation of natural resources, which allows companies to produce goods for a longer period. The objective of this approach is not only to preserve the environment but also to decrease the societal burden of healthcare expenses by reducing the risks to environmental health.

Awareness (F5)

The factor Awareness accounts for 7.618 percent of variance. The utilization of recycled materials in the production of sustainable packaging reduces the depletion of natural resources. The respondents are aware that sustainable packaging can encourage packaging reuse and minimize the ecological footprint.

Convenience (F6)

According to the study, the convenience factor explains 7.326 percent of variance. Sustainable packaging that is reusable, recyclable, and biodegradable can facilitate waste management. In addition, eco-labels can serve as an effective means of encouraging consumers to adopt sustainable behaviours, ultimately supporting the goals of a circular economy.

Initiative (F7)

With 5.994 percent of variance explained, this factor emphasizes the importance of raising consumer awareness regarding sustainable packaging. In order to develop viable alternatives to plastic, it is crucial to educate consumers on the benefits of eco-friendly packaging. The growth of the sustainable packaging industry is likely to be propelled by increasing consumer awareness and the implementation of strict regulations banning the use of single-use plastics.

3.3 Hypothesis Testing

- **H_1:** There are significant factors affecting consumer perceptions towards sustainable packaging.

Based on the factor loading analysis conducted in this study, we have found significant factors that strongly influence consumer perceptions towards sustainable packaging. The factor loadings indicate a clear relationship between these factors and consumer attitudes, suggesting that sustainable packaging attributes play a crucial role in shaping consumer perceptions. Therefore, we reject the null hypothesis, concluding that there are indeed significant factors affecting consumer perceptions towards sustainable packaging.

4.0 LIMITATIONS OF THE STUDY

The scope of the current study is limited to examining the perspectives of Indian consumers on sustainable and eco-friendly packaging, suggesting the need to expand the study to include a broader geographical region. In addition, future research could explore the mechanisms of the global market and their online platforms.

5.0 SCOPE FOR FURTHER RESEARCH

The significance of sustainable packaging in the business domain is a focal point of the current study. It emphasizes the use of environmentally-friendly packaging materials for the purpose of

achieving sustainable development. In the packaging value chain, the packaging materials hold a crucial role as they make up more than fifty percent of the total packaging cost. To expand the scope of research, sustainable technologies can also be incorporated.

6.0 CONCLUSION AND RECOMMENDATIONS

Sustainable Solutions for Ecommerce Companies

- *Packaging Alternatives:* Companies should shift from traditional packaging to more environmental-sustainable packaging such as materials with 80 percent or more recyclable materials. Eco-friendly packaging together with right-sized packaging will contain generated waste from directly going into landfills.
- *Transportation Alternatives:* Developed as well as developing countries are slowly adapting to pollution-free vehicles. Ecommerce companies can follow it and take action to replace their vehicle fleet with electric vehicles with zero emissions. Another factor that is focussed as an environmentally conscious practice is sustainable shipping. The only drawback to this is that customers should be willing to pay more for choosing this shipping option. There are some large logistics companies like DHL offering climate-neutral shipping options to online customers.
- *Saving on Energy Costs:* Increased consumption of energy in the office environment, warehouses and other locations can adversely impact the environment. A sustainable e-Commerce company should implement an energy audit of all locations and adopt measures for low energy lighting that will substantially save energy.
- *Carbon Offset Charge:* An e-Commerce company that is determined about sustainability can counteract problems associated with its products and service by projects that restrain greenhouse emissions. It can be a contributory effort from the company along with voluntary participation from the customers. The e-Commerce company can create awareness and request customers to pay an additional surcharge on their regular purchases as a carbon offset charge during the check-out.
- *Incorporating a Circular Approach:* An e-Commerce company can appeal to customers to provide a second life to their used products. This process is termed as a circular economy as it gives rise to resale and refurbished goods market as well as e-Commerce sustainable fashion. The objective is to motivate customers to resell products or purchase recycled products.

As consumers become more conscious and informed about environmentally-friendly alternatives, the packaging industry is following suit by adopting sustainable options. Packaging companies worldwide are seeking ways to reduce resource wastage through eco-friendly and sustainable packaging practices. However, since sustainable packaging is still in its early stages, manufacturers must adopt eco-friendly packaging practices to promote and safeguard the environment.

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