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ONE TIME PLASTICS AND ECO FRIENDLY ALTERNATIVES: A STUDY OF CONSUMER BEHAVIOUR

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ABSTRACT

Plastic industry is one of the fastest growing industries across the globe. Owing to its varied applications, the demand for plastics is estimated to grow at a CAGR of 4% during the forecast period 2019-2025 [1]. However, excessive use of plastics generates tremendous amounts of plastics waste. Plastic recycling and use of

biodegradable alternatives could be a few solutions to plastic pollution caused by plastic wastes. However, the implementation of these alternatives is still at a very nascent stage because of their inherent limitations. This study is undertaken to understand the consumer perception and behavior towards one-time use plastics (OTPs) and their eco-friendly alternatives (EFAs). Factor Analysis is used to understand the coexisting consumer perception towards OTPs and EFAs which revealed three different attitudes of consumers – consciousness towards EFAs, support towards EFA usage and reliance on OTP usage. Cluster Analysis is carried out to respectively gauge the non-coexisting consumer perception and behavior towards OTPs and EFAs based on their qualitative attributes.The analysis resulted in identification of specific consumer groups while consolidating consumer perceptions and the qualitative attributes of OTPs and EFAs separately.

KEYWORDS: *Plastics, One-Time Use Plastics, Eco-Friendly Alternatives, Perception, Behavior.*

1. INTRODUCTION

Plastic is one of the most widely used materials in India. Owing to its strength, durability, weather resistance and fire resistance properties it is extensively used in our everyday lives for packaging and storage of items. Plastic and plastic products also find their applications in transportation, aerospace, construction and electronic industries. In FY 2019, the total demand for major plastics across India was approximately 16 million metric tons, out of which polyethylene with around 5.3 million metric tons, had the highest demand [2]. The most heavily used plastics in our lives are OTPs commonly referred to as single use plastics. As per Business Today reports 2019, the single use plastic industry had a market size of approximately Rs. 80,000 Crore[3].

Excessive use of plastics, especially OTPs leads to the generation of tremendous amounts of plastic wastes in our country leading to plastic pollution and environmental degradation. Central Pollution Control Board report (2018-19) puts the total annual plastic waste generation in India at a humongous 3.3 million metric tonnes per year in 2018-19.[4]. OTPs or single use plastics are non-biodegradable and have an average life span of thousands of years as a result the plastic waste generated through the use of OTPs keeps on accumulating within landfills. In addition to this, the improper management of plastic waste leads to ecological degradation, leaching, land pollution, inter alia.

Recycling of plastic waste and/or use of biodegradable plastics could be few solutions to the menace caused due to plastic wastes, however, such techniques are implemented at a very nascent stage. Plastic recycling is challenging to implement on a large scale because of the low economic value of recycled plastic. While

plastic recycling may help to reduce the burden on plastic waste management but it can never wholly overcome its menace. On the other hand, use of biodegradable plastics also comes with own set of limitations as most of the bioplastics do not break down in home composts, landfills and neither do they decompose when left loose in the environment. Most bioplastics thus require commercial composting facilities, which is often not feasible and is neither available to the average consumer.

The use of EFAs thus theoretically acts as the only solution to curb plastic pollution, as most EFAs are natural and generally avoid petrochemical products in their manufacture. Although there are lot of alternatives available, but they have not grown up to their potential. Since consumers question the strength, availability and durability of EFAs they prefer using plastics owing to their inherent strength.

Thus, with this study we aim to understand the coexisting consumer perception towards the use of OTPs and EFAs. We also analyse the non-coexisting consumer perception and behaviour towards OTPs and EFAs separately based on their qualitative attributes and identify specific consumer groups by consolidating the qualitative attributes of OTPs and EFAs.

2. Review of Literature

L.C De (2020) [5] studied the plastic market and showed that one of the main advantages of one-time use plastics is their low cost and that 12% of the plastic waste is incinerated and rest forms landfills in India where 95 lakh tomes of plastic waste is generated per annum of which 38 lakh tones of plastic remain uncollected. He emphasized the importance of government programs and use of alternatives of plastics.

Melissa L.VanRensburg, S'phumelele L. Nkomo, Timothy Dube (2020) [6] in South Africa, analyzed the consumer perception towards the one-time use plastics using primary research to gain consumer insights. According to the authors, the beachgoers had a more negative perception towards the consumption of single-use plastic and were aware towards their environmental impact and thus suggested a plastic bag ban.

Sabrina Pereira (2019) [7] suggested that the majority of the respondents (consumers) from Rhode islands are in favor of one-time use plastics. Here, researchers hypothesized that the people living near to the shores are more aware of the plastic pollution as compared to the inland residents but their null hypothesis was not accepted after performing statistical analysis.

Joshua O'Brien, GladmanThondhlana (2019) [8] gathered consumer perception and their willingness to pay for continued use of plastic bags in South Africa. Authors found that convenience was the main reason behind single use plastics' high usage. But, Tony Robert Walker, EamonnMcGuinty, Sylvain Charlebois. Janet Music (2021) [9] showed that despite the consumers being aware of environment

challenges being caused by single-used plastics and their willingness to reduce their use, they were still reluctant to pay for the alternatives and rather opted for sustainable packaging in case of food packaging. Thus, outright plastic ban was not desired despite environmental concerns being more critical than food safety.

Diana Starovoytova (2016) [10] conducted a survey on Kenyan population to understand consumer's perception regarding plastic bags by taking several variables into account and concluded that regardless of the demographics, 80% of the population used plastic bags daily due to extremely low prices which caused disposal problems too. She recommended that the government and NGOs should arrange conferences, workshops and competitions to seek solutions. The government should also run awareness programs using various media on the short and long-term harmful effects of plastic bags litter.

To study the consumer behavior in Vietnam, Hoai Do, Do HoaiLinh, Cam Thai, Thi Do, Chi Hai, ThiLuong, Ngoc Bich, Phuong Nhi Hoang, Phuong Hoang, Nguyen (2019) [11]analyzed several factors that influence intentions to reduce plastic waste and concluded upon emphasizing the role of the government for promotion and providing subsidies and the role of celebrities, influencers for promotion while that of private players for R&D along with public awareness and commitment.

Similarly, A.N. Hoai (2017) [12] tried to collate consumers perception on green packaging in terms of whether it is able to fulfil the functions of plastic or not and concluded that public awareness is a must to shift consumers perception towards green packaging and for that the entrepreneurs can conduct various campaigns to spread awareness and to encourage use of plastic alternatives.

Lawrence sustainability advisory board (2019) [13]analyzed the then situation of plastic and recommended first, a ban on single use plastic shopping bags and second, retailers should charge consumers a fee for the plastic bag and third, education campaigns should be conducted to make people aware of the plastic pollution.

3. Rationale for the Study

The above studies don't cover all aspects of plastics in general and OTPs in particular in a single research. Further, none of the aforementioned studies comment on the coexistent perception of OTPs and EFAs and therefore, they cannot be used to gauge consumer perception and behavior of OTPs and EFAs together. Besides, some of the aforementioned studies are not particularly focused on the Indian consumer. Given that Indian consumers differ significantly from the foreign countries in terms of their demographics, financial, economic and cultural aspects where these studies are carried out, the results from the same cannot be directly applied to the Indian markets. Besides, there is a need to do an in-depth study on the consumer perception of OTPs and EFAs based on their common

qualitative attributes. Hence, we undertake this research to cover the priorresearch gap and to uncover the insights of both coexisting and non-coexisting consumer perception and behavior towards OTPs and EFAs based on their qualitative characteristics.

4. Research Objectives

The objective of this paper is to conduct a research to study the consumer perception and behavior regarding the OTPs & the EFAs.

This includes identifying the main reasons and the factors that affect the consumer perception andchoices.

Also, to identify clusters of people regarding their opinions on views and attributes of both OTPs and EFAs.

5. Research Methodology

5.1 Research Design

The research is carried out using Descriptive Research Design.

5.2 Scope of Research

Our target population includes consumers and shop-owners in Delhi-NCR.

5.3 Data Collection

The study involves the use of primary data collected using a Structured Questionnaire. Likert's Scale is used to collect psychographic data about qualitative attributes of OTPs and EFAs. Semantic differential scale is used to collect data regarding consumer perception of OTPs and EFAs.

5.4 Method of Administration

The survey is administered through Google Forms and respondents were reached out through both offline methods and digital platforms such as – LinkedIn, WhatsApp and E-mails.

5.5 Data Analysis

This research makes use of various descriptive and inferential statistical tools. Graphical and percentage analysis are used for descriptive analysis that is carried out using MS Excel. Factor Analysis is conducted to gauge coexistingconsumer perception of OTPs and EFAs. While, Cluster Analysis is employed to understand consumer perception of OTPs and EFAs on the basis of their qualitative characteristics such as - availability, durability, strength, value for money and significance. Statistical Package for the Social Sciences (SPSS) is used to carry out both Factor and Cluster Analysis.

5.6 Sampling

The target population includes adults being household consumers and shop-owners using OTPs and/or EFAs. The techniques of Convenience Sampling and Snow Ball Sampling are employed to decide the units of the sample. A total of 241 responses are received; however, 31 responses are rejected being incomplete and/or being out of the scope of the study.

5.6.1 Sample Size: 210 respondents

5.6.2 Period of Data Collection: The data collection period spans from March 2020 to May 2020.

5.6.3 Sample Profile

TABLE 1: SAMPLE PROFILE OF RESPONDENTS BASED ON DEMOGRAPHICS

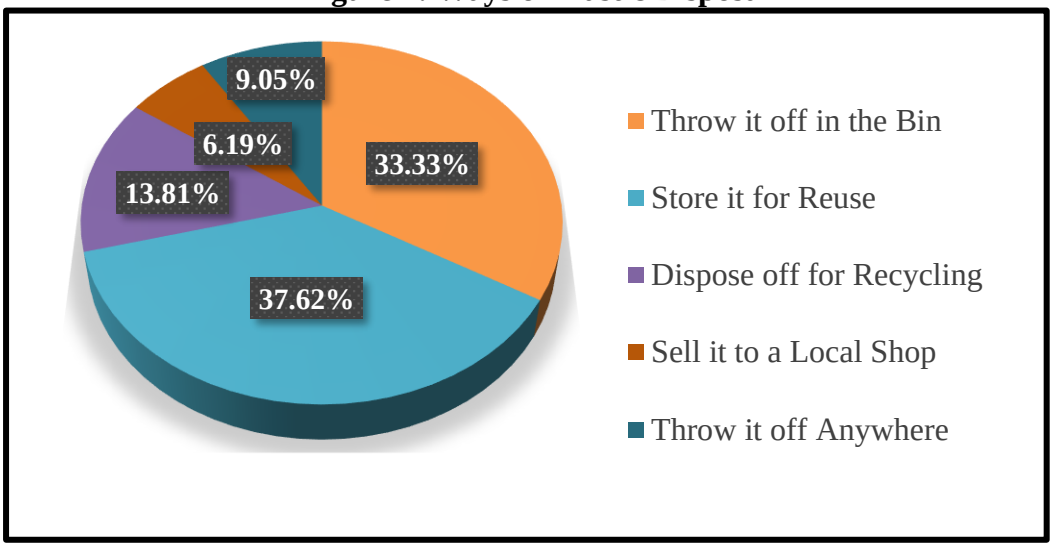
Demographic Variable	Particulars	Count	Percentage (%)
Gender	Male	117	55.71%
	Female	93	44.29%
Age	18-35	201	95.71%
	35-45	7	3.33%
	45-60	1	0.48%
	Above 60	1	0.48%
Education	College	209	99.52%
	No Formal Education	1	0.48%
Family Income	Less Than 5 LPA	39	18.57%
	5-10 LPA	67	31.90%
	10-15 LPA	40	19.05%
	15-20 LPA	28	13.33%
	20-30 LPA	18	8.57%
	Above 30 LPA	18	8.57%
Occupation	Students	137	65.24%
	Working Class	69	32.86%
	Non-Working Class	4	1.90%

6. Findings & Analysis

6.1 Graphical Analysis

6.1.1 Ways of Plastic Disposal

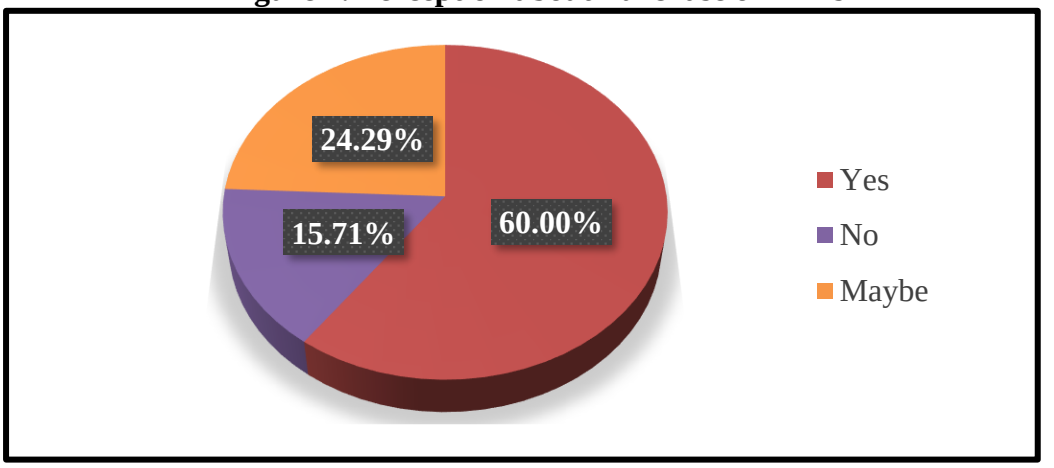
Figure 1: Ways of Plastic Disposal



According to Figure 1,37.62% of the consumers store the plastics for reuse and 33.33% of them dispose if off in the bin. Whereas, 13.81% of consumers send plastics for recycling.

6.1.2 Perception about Purchase of EFAs

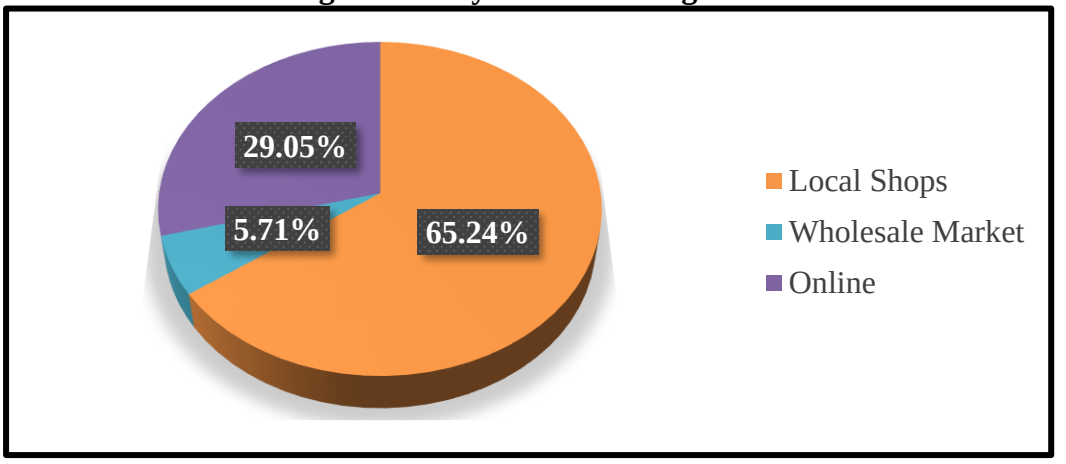
Figure 2: Perception about Purchase of EFAs



According to Figure 2, 60% of the consumers purchase (or would prefer to purchase) EFAs instead of OTPs. While, 24.29% of the consumers, may purchase EFAs over OTPs.

6.1.3 Ways of Purchasing EFAs

Figure 3: Ways of Purchasing EFAs



According to Figure 3, 65.24% of the consumers would like to purchase EFAs from local shops, while 29.05% of the consumers would like to purchase it online.

6.2 Factor Analysis

This research employs the useof factor analysis to decipher the factors that are relevant for studying the coexisting perception of consumers using OTPs and EFAs. Factor Analysis aids in reducing the 13 qualitative variables into 3 relevant factors (representing) an index of linear transformation of the initial 13 variables in this study. The 3 components so extracted represent 3 different attitudes of consumers towards OTPs and EFAs.

TABLE 2: SAMPLE ADEQUACY TEST

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.673
Bartlett's Test of Sphericity	Approx. Chi-Square	350.083
	Df	78
	Sig.	.000

Table 2 shows the sample adequacy as well as relations between the factors obtained through factor analysis. According to this, the KMO value is 0.673 which is greater than 0.6, signifying that the data is adequate for analysis and generating results that can be applicable to whole population as well. The Bartlett test value is 350.083 and it is statistically significant (0.00<0.05) that means there is significant relation between the factors.

TABLE 3: COMMUNALITIES

S.No.	Variable	Initial	Extraction
1	OTPs are a necessity in our daily lives.	1.000	.669
2	People have become habitual to OTPs.	1.000	.661
3	People usually carry OTPs while shopping.	1.000	.238
4	OTPs do not pollute the environment.	1.000	.654
5	OTPs do not cause cancer, even after prolonged use.	1.000	.574
6	OTPs can be easily recycled.	1.000	.604
7	Consumers are becoming more conscious towards the use of EFAs.	1.000	.562
8	Shop-owners are becoming more conscious towards the use of EFAs	1.000	.592
9	Govt. is taking adequate measures to promote EFAs.	1.000	.425
10	Enforcing laws can help to curb OTPs.	1.000	.472
11	EFAs can replace OTPs from our daily lives.	1.000	.770
12	EFAs can eliminate environmental pollution.	1.000	.658
13	Indian Markets are still a long way from replacing OTPs by EFAs.	1.000	.343

Table 3 shows how much variation in each of the aforementioned variables is accounted for by the extracted factors. Out of the 13 variables employed in this study, 4 variables – Variable 3, Variable 9, Variable 10 and Variable 13 are dropped, as they have communality values less than 0.5. Thus, they are not showing much of the variation and are hence excluded from further analysis.

TABLE 4: INITIAL AND EXTRACTED EIGEN VALUES

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.151	24.235	24.235	3.151	24.235	24.235
2	1.580	12.157	36.392	1.580	12.157	36.392
3	****					
4	1.113	8.560	55.548	1.113	8.560	55.548
5	.999	7.685	63.233			
6	.915	7.041	70.274			
7	.813	6.254	76.528			
8	.742	5.704	82.232			
9	****					

10	****					
11	.458	3.521	94.552			
12	.412	3.168	97.720			
13	****					

**** variable(s) excluded

Table 4 shows the initial as well as the extracted eigen values of the 13 extracted factors. In selecting the extraction of factorial groups, the Kaiser criterion is adopted. As per the Kaiser criterion, all factors should be accepted whose Eigen values are higher than 1.0. Hence, we extract the 1st, 2nd and 4th variable as they have eigen values greater than 1 and account for a total of 55.548% of the variation in the data.

TABLE 5: ROTATED COMPONENT MATRIX

S.No.	Variable	Component		
		1	2	4
1	OTPs are a necessity in our daily lives.	-.022	-.065	.781
2	People have become habitual to OTPs.	.391	.055	.631
3	People usually carry OTPs while shopping.	.435	.140	.021
4	OTPs do not pollute the environment.	.001	-.153	-.026
5	OTPs do not cause cancer, even after prolonged use.	.150	.046	-.004
6	OTPs can be easily recycled.	-.391	.429	.424
7	Consumers are becoming more conscious towards the use of EFAs.	.668	.257	.087
8	Shop-owners are becoming more conscious towards the use of EFAs.	.762	.040	.088
9	Govt. is taking adequate measures to promote EFAs.	.586	.164	.198
10	Enforcing laws can help to curb OTPs.	.403	.369	.249
11	EFAs can replace OTPs from our daily lives.	.364	.783	-.158
12	EFAs can eliminate environmental pollution.	.182	.780	.073
13	Indian Markets are still a long way from replacing OTPs by EFAs.	.224	.036	.508

The idea of rotation is to reduce the number of factors on which the variables under investigation have high loadings. Further,this study considersonly those items in the extracted components whose factor loading are higher than 0.5. As per Table 5, variables 7, 8 and 9 have high factor loadings on the 1st extracted component. Variables 11 and 12 have high factor loadings on 2nd extracted

component, while variables 1, 2 and 13 have high factor loadings on 4th extracted component.

Inferences

- The 3 extracted components from the factor analysis represent 3 different attitudes of consumers towards OTPs and EFAs based on the variables involved in the study.
- The 1st extracted component shows that consumers and shop-owners are willing to purchase EFAs as they are aware of how EFAs can help in subduing the problem caused by excessive usage of OTPs. They all are also aware about the steps taken by the government to curb the usage of OTPs and to promote the use of EFAs. Hence, both the consumers and the shop-ownersare conscious about EFAs.
- The 2nd extracted component shows that consumers and shop-owners feel that EFAs can replace OTPs from our lives and can curb environmental pollution caused due to the generation of plastic waste and hence they are supportive about usage of EFAs.
- The 4th extracted component shows that the consumers and shop-owners still prefer to use OTPs and also feel that it will take a very long time to completely remove OTPs from the markets. Thus, they are still relying on using OTPs.

6.3 Cluster Analysis

Cluster Analysis is carried out in order to respectively understand the non-coexisting consumer perception and behavior towards OTPs and EFAs separately, based on their qualitative attributes.

6.3.1 Cluster Analysis concerning common convictions of OTPs

This study gauges consumer perception and behavior towards OTPs. The convictions that are considered in this study include: necessity of OTPs, habituality of OTPs, frequent usage of OTPs, pollution causing ability of OTPs, cancer causing ability of OTPs and recyclability of OTPs.

TABLE 6: NOTATIONAL REPRESENTATION

Variable	Notational Representation
OTPs are a necessity in our daily lives.	OTP_Necessity
People have become habitual to OTPs.	OTP_Habituality
People usually carry OTPs while shopping.	OTP_FreqUse
OTPs do not pollute the environment.	OTP_Pollution
OTPs do not cause cancer, even after prolonged use.	OTP_Cancer
OTPs can be easily recycled.	OTP_Recyclability

TABLE 7: ANOVA

Variable*	Cluster		Error		F	Sig.
	Mean Square	Df	Mean Square	df		
OTP_Necessity	67.544	2	.986	207	68.480	.000
OTP_Habituality	26.172	2	1.233	207	21.222	.000
OTP_FreqUse	5.688	2	1.429	207	3.980	.020
OTP_Pollution	124.739	2	.590	207	211.269	.000
OTP_Cancer	52.797	2	1.033	207	51.087	.000
OTP_Recyclability	22.604	2	1.552	207	14.564	.000

*using notational representation given in Table 6.

According to table 7, the significance value for all our variables is less than 0.05. Thus, the results of our model are statistically significant.Also, as per table 9, the number of the elements in each cluster do not show much deviation and thus the assumptions of cluster analysis stand validated.

TABLE 8: FINAL CLUSTER CENTERS

Variable*	Cluster		
	1	2	3
OTP_Necessity	1	0	-1
OTP_Habituality	1	0	1
OTP_FreqUse	0	0	0
OTP_Pollution	-2	1	-2
OTP_Cancer	-1	1	-1
OTP_Recyclability	0	0	-1

TABLE 9: NUMBER OF CASES IN EACH CLUSTER

Cluster	1	76.000
	2	56.000
	3	78.000
Valid		210.000
Missing		.000

*using notational representation given inTable 6.

Inferences

- Based on the final cluster centers given in Table 8, the common convictions of consumers regarding OTPs are consolidated and 3 different consumer groups are identified.
- Cluster 1: A total of 76 (36.19%) consumers lie in this group and they are habitual to use OTPs and thus, agree that they are indeed a necessity in their lives.
- Cluster 2: A total of 56 (26.67%) consumers lie in this group and such consumers do not take a stand on the necessity of OTPs in everyday lives and thus, also agree upon the fact that the OTPs do cause cancer and pollute the environment.
- Cluster 3: A total of 78 (37.14%) consumers lie in this group. These people do not consider plastics as a necessity. However, they are habitual to the use of OTPs and hence do not feel that OTPs cause pollution or cancer.

6.3.2 Cluster Analysis concerning Qualitative Attributes of OTPs

This study considers the qualitative attributes of consumers regarding OTPs. The qualitative attributes that are considered are: necessity of OTPs, habituality of OTPs, frequent usage of OTPs, pollution causing ability of OTPs, cancer causing ability of OTPs and recyclability of OTPs.

TABLE 10: NOTATIONAL REPRESENTATION

Qualitative Attribute	Notational Representation
Availability of OTPs	OTP_Availablity
Durability of OTPs	OTP_Durability
Strength of OTPs	OTP_Strength
Value for money of OTPs	OTP_ValForMoney
Significance of OTPs	OTP_Significance

TABLE 11: ANOVA

Variable*	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
OTP_Availablity	44.533	2	.673	207	66.148	.000
OTP_Durability	62.042	2	.782	207	79.306	.000
OTP_Strength	82.595	2	.628	207	131.449	.020
OTP_ValForMoney	53.274	2	.769	207	69.293	.000
OTP_Significance	64.229	2	.851	207	75.453	.000

*using notational representation given in Table 10.

According to Table 11, the significance value for all our variables is less than 0.05. Thus, the results of our model are statistically significant.Also, as per table 13, the

number of the elements in each cluster do not show much deviation and thus the assumptions of cluster analysis stand validated.

TABLE 12: FINAL CLUSTER CENTERS TABLE

Variable*	Cluster		
	1	2	3
OTP_Availablity	1	1	-1
OTP_Durability	0	1	-1
OTP_Strength	0	1	-1
OTP_ValForMoney	0	1	-1
OTP_Significance	0	1	-1

13: Number of Cases in each Cluster

Cluster	1	64.000
	2	105.000
	3	41.000
Valid		210.000
Missing		.000

*using notational representation given in Table 10.

Inferences

- Based on the final cluster centers given in Table 12, consumer perception regarding qualitative attributes of OTPs are consolidated and 3 different consumer groups are identified.
- Cluster 1:A total of 64 (30.47%) consumers lie in this group and such consumers agree that OTPs are readily available. However, they do not take a stand on other attributes.
- Cluster 2: A total of 105 (50.00%) consumers lie in this group and such consumers agree upon the fact that OTPs are readily available, are durable, have strength, and have value for money and are significant int their lives too.
- Cluster 3:A total of 41 (19.52%) consumers lie in this group and they disagree on the fact that OTPs are readily available, durable, have strength, and have value for money and significance.

6.3.3 Cluster Analysis concerning Common Convictions of EFAs

This study gauges consumer perception and behavior towards EFAs. The convictions that are considered include: consumer consciousness about EFAs, shop-owner consciousness of EFAs, government initiatives regarding EFAs, law enforcement promoting EFA usage, pollution elimination through the use of EFAs and replacement of OTPs by EFAs.

TABLE 14:NOTATIONAL REPRESENTATION

Variable	Notational Representation
Consumers are becoming more conscious towards the use of EFAs	EFA_CConsciousness
Shop-owners are becoming more conscious towards the use of EFAs	EFA_SOConsciousness
Govt. is taking adequate measures to promote EFAs	EFA_GovtMeasure
Enforcing laws can help to curb OTPs and promote EFA usage	EFA_EnforceLaw
EFAs can eliminate environmental pollution	EFA_Eliminate
Indian markets are still a long way from replacing OTPs by EFAs	EFA_Replace

TABLE 15: ANOVA

Variable*	Cluster		Error		F	Sig.
	Mean Square	Df	Mean Square	Df		
EFA_CConsciousness	67.544	2	.986	207	68.480	.000
EFA_SOConsciousness	26.172	2	1.233	207	21.222	.000
EFA_GovtMeasure	5.688	2	1.429	207	3.980	.020
EFA_EnforceLaw	124.739	2	.590	207	211.269	.000
EFA_Eliminate	52.797	2	1.033	207	51.087	.000
EFA_Replace	22.604	2	1.552	207	14.564	.000

*using notational representation given in Table 14.

According to Table 14, the significance value for all our variables is 0.000 that is less than 0.05.Thus, the results of our model are statistically significant. Also, as per table 17, the number of the elements in each cluster do not show much deviation and thus the assumptions of cluster analysis stand validated.

TABLE 16: FINAL CLUSTER CENTERS

Variable	Cluster		
	1	2	3
EFA_CConsciousness	0	0	1
EFA_SOConsciousness	-1	0	1
EFA_GovtMeasure	0	-1	1
EFA_EnforceLaw	1	-1	1
EFA_Eliminate	1	-1	1
EFA_Replace	1	0	1

TABLE 17: NUMBER OF CASES IN EACH CLUSTER

Cluster	1	57.000
	2	61.000
	3	92.000
Valid		210.000
Missing		.000

*using notational representation given in Table 14.

Inferences

- Based on the final cluster centers given in Table 16, the common convictions of consumers regarding EFAs are consolidated and 3 different consumer groups are identified.
- Cluster 1: A total of 57 (27.14%) consumers lie in this group and they feel that enforcement of laws can promote the usage of EFAs. Also, they feel that EFAs can eliminate environmental pollution and replace OTPs from Indian Markets.
- Cluster 2: A total of 61 (29.04%) consumers lie in this group and they do not take a stand on replacing plastics with eco-friendly alternatives and hence disagree upon the factors that suggested the use of the same.
- Cluster 3: A total of 78 (43.80%) consumers lie in this group. They all agree upon the measures suggested to encourage the use of eco-friendly alternatives.

6.3.4 Cluster Analysis concerning Qualitative Attributes of EFAs

This study considers the qualitative attributes of consumers regarding OTPs. The qualitative attributes that are considered are: necessity of EFAs, habituality of EFAs, frequent usage of EFAs, pollution causing ability of EFAs, cancer causing ability of EFAs and recyclability of EFAs.

TABLE 18: NOTATIONAL REPRESENTATION

Qualitative Attribute	**Representation**
Availability of EFAs	EFA_Availablity
Durability of EFAs	EFA_Durability
Strength of EFAs	EFA_Strength
Value for money of EFAs	EFA_ValForMoney
Significance of EFAs	EFA_Significance

TABLE 19: ANOVA

Variable*	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
EFA_Availablity	3.002	1	1.621	208	1.852	.000
EFA_Durability	146.417	1	.796	208	184.003	.000
EFA_Strength	118.442	1	.948	208	124.882	.020
EFA_ValForMoney	30.817	1	1.552	208	19.857	.000
EFA_Significance	69.697	1	1.221	208	57.061	.000

*using notational representation given in Table 18.

According to Table 19, the significance value for all our variables is less than 0.05. Thus, the results of our model are statistically significant. Also, as per Table 21, the number of the elements in each cluster do not show much deviation and thus the assumptions of cluster analysis stand validated.

TABLE 20: FINAL CLUSTER CENTERS

Variable*	Cluster	
	1	2
EFA_Availablity	0	0
EFA_Durability	1	-1
EFA_Strength	1	0
EFA_ValForMoney	1	0
EFA_Significance	1	0

TABLE 21: NUMBER OF CASES IN EACH CLUSTER

Cluster	1	77.000
	2	133.000
Valid		210.000
Missing		.000

*using notational representation given in Table 20.

Inferences

- Based on the final cluster centers given in Table 20, consumer perception regarding qualitative attributes of EFAs are consolidated and2different consumer groups are identified.
- Cluster 1:A total of 77 (36.67%) consumers lie in this group and such consumers agree that EFAs are durable, have strength, have value for money and are significant. Though, they doubt about the availability of EFAs.

- Cluster 2: A total of 133 (63.33%) consumers lie in this group and such consumers cannot take any stance on EFAs. They also feel that EFAs are not durable.

7. CONCLUSIONS

- By employing factor analysis on the common convictions of OTPs and EFAs this study concludes that consumers and shop-owners showcase three different sets of attitudes based ontheir usage of OTPs and EFAs. The three different sets of attitudes are: consciousness for EFAs, support towards EFA usage, and reliance of OTP usage.
- Further, cluster analysis reveals different consumer groups based on the common convictions and qualitative attributes of both OTPs and EFAs separately by consolidating the common convictions and qualitative attributes of OTPs and EFAs.
- For OTPs, the analysis reveals that 36.19% of the consumers perceive OTPs as a necessity in their everyday lives. While 37.14% of the consumers perceive that though OTPs are not a necessity, but since they are habitual to their use, they do not perceive them causing environmental pollution or cancer.
- A behavioral study of OTPs on the basis of their qualitative attributes reveals that 50% of the consumers agree upon the fact that OTPs are readily available, durable, have strength, and have value for money and significance.
- For EFAs, the analysis reveals that 43.80% agree that both consumers and shop-owners are conscious towards using EFAs and also agree upon the fact that strict government measures and proper law enforcement can aid in replacing EFAs by OTPs in Indian markets.
- A behavioral study of EFAs on the basis of their qualitative attributes reveals that 63.33% of consumers cannot really gauge the availability and strength of EFAs. They also do not take a stand on the value for money and significance of EFAs, while believing that EFAs are not durable.

8. Managerial Implications

- On the basis of the 3 different attitudes of consumers and shop-owners it is inferred that both consumers and shop-owners are aware about the environmental hazards caused by excessive use of OTPs due to which they are willing to purchase EFAs instead of OTPs. In addition to this, they are aware about the benefits of using EFAs over OTPs. The reason of still having significant amount of plastic waste in the environment can be attributed to the fact that most of the consumers and shop-owners have

become habitual to use OTPs, due to their inherent strength, ready availability and durability. Hence, consumers are inclined to believe that it will take a very long time to completely eradicate OTPs from the Indian markets. Further, there are lot of alternatives available but they fairly loose out against plastic because of their inherent limitations. Unless, better alternatives that are par with the qualitative attributes of plastics come to the market, it is difficult to expect a paradigm shift to EFAs.

- The government should make people aware about the dangers of excessive use of plastics and about the challenges of managing plastic wastes and ensure proper delivery regarding benefits of EFAs and how they can be substituted for OTPs.
- Government should also bring in stricter norms both for shop-owners and households to prevent excessive use of plastics. Stricter norms may include cancellation of shop licenses for shop-owners and fines for consumers, if found using plastics and plastic products. Laws should also be formulated for proper disposal of plastic wastes by households and shop-owners.
- Further, EFA manufacturers need to market their products in a manner that makes consumers aware about their strength and durability. Besides, quality manufacturing of EFA products would be a key to create value in the eyes of consumers.

9. Limitations of the Study

- The data is obtained through Convenience and Snow Ball sampling and includes sample units only from Delhi-NCR andhence the obtained sample is not entirely representative. Thus, the results cannot be easily extrapolated and generalized.
- The data is collected during the lockdown period, which may have an influence on the responses of both the consumers' andshop-owners'.
- The study only considers OTPs and EFAs in general and does not comment upon the consumer perception and behavior regarding specific types of OTPs (carry bags, plastic bottles, plastic wrappers etc.) and EFA (cloth, wood, bamboo, paper, etc.).

10. Scope for Further Research

- A more detailed psychographic profiling of the respondents.
- State wise disparities regarding consumer perception and behavior of OTPs and EFAs can be studied and analyzed.
- In-depth analysis regarding the effect of qualitative attributes on OTP and EFA pricing.

- In-depth study regarding consumer perception and behavior of specific types of OTP (plastic drinking bottles, plastic grocery bags, plastic food wrappers etc.) and EFAs (cloth, wood, bamboo, paper, etc.).

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