Use of Statistical Tools to Study the Consumer Preference Over Green Products

Meena Vazirani

Assistant Professor

SVKM's Narsee Monjee College of Commerce and Economics, Vile Parle (W),Mumbai, India

ABSTRACT: Now a days, people are more concerned with the environment change. Hence, they prefer environment friendly products. The present study is based on the behavior of consumers towards green products. To study this, a primary data set is taken. The data is collected through a questionnaire and the response of consumers of green product is collected to know their preference over the green products. The data is analysed in detail to describe the various statistical methods. The techniques used here are explained in detail. It is required to know the basics of the calculations if one wants to use these tools. From the data it is found that the consumers' preference does depend on many parameters. The tabular and graphical presentation of the data is employed to give the clear picture of the responses. The relationship between two parameters responsible for the preferences of people over green marketing is shown by contingency tables and appropriate hypothesis tests are used to study the relationship between variables. A detailed discussion is done in the paper.

Key Words: Green products, Consumer behavior, contingency table, Chi square test, p-value.

I. INTRODUCTIOM:

Green products are the one whose manufacturing, purchase and use allow economic development, while still conserving for future generations. Such products do not pollute the earth or abort natural resources. In the present time, there is high demand of green products. People, now a days are preferring buying the products which are environment friendly, still there is a need to educate people and make them aware of environmental threats.

In a seminar organized by American Marketing Association (AMA) in 1975 , "Green Marketing" term was first discussed/ and took its place in literature, Tiwari (2016). Peattie (2001) has discussed the three phases of green marketing: Ecological, Environmental and Sustainable. During Ecological phase of Green Marketing, the marketing activities were concerned to help environmental problems and to provide remedies to those problems. During the second phase of green marketing, i.e. Environmental phase, the focus was shifted to clean technology that involves the designing of innovative products that take care of pollution and waste issues. The third phase, sustainable green marketing came into existence in late 1990 and early 2000. It was concerned with developing the products that meet the criteria of quality, performance, pricing and convenience in an eco friendly way.

The present paper aims to study the preference of consumers over green products. The study investigates the relationship between variables that influence consumer's buying behavior for green products. Convenience sampling method is used to select respondents from different cities of India. The plan of the paper is as follows. The next section gives the details of the literature review. Research methodology is discussed in section III. In this section, the significance of study, objective of study and the methodology are discussed in subsections. Section IV explains the data analysis and results. The last section V gives the conclusion.

II. LITERATURE REVIEW:

Alwit and Berger (1993) have examined the structure and behavioral implications of a model of attitude in an environmentally sensitive product domain. They measured attitude valence and the dimensions of attitude strength with respect to a single product category- single-serve aseptic fruit juices and puddings. It was inferred from the analysis that general attitude towards environment is not significantly related to purchase intension.

Follows and Jobber (2000) have tested a consumer model of environmentally responsible purchase behavior using covariance structural analysis. The model predicted the purchase of environmentally responsible and non-responsible product alternatives. A hierarchical relationship from values to product specific attitude to purchase behavior was confirmed.

Chen (2001) has discussed that the product design to minimize the use of non-renewable resource, avoiding toxic materials and renewable resources during its life-cycle would be the most effective manner to display green technological development.

Das (2002) has presented the emerging issues and ideas on environmental pollution and also the role of the government and business organizations in India to mitigate the effects of environmental degradation. The article presents an idea of the concepts such as environmental goods, environmental services, green marketing and green consumers.

Palodinn and Baggiere (2008) have done study on reasons behind consumer's purchase of green electricity. The study examined residential electricity consumers in Australia.

In a research article, Ali et.al (2011) have examined the Pakistani Consumer's intention to buy environmentally friendly products. In the study they had examined and investigate the relationship between predictor variable(green purchase attitude) and criterion variable (green purchase intention) and also between criterion variable and outcome variable (green purchase behavior).

Kim and Chung (2011) have attempted to provide insights into US consumer behavior regarding organic personal care products by examining the factors that influence consumers' attitude toward buying them and consumers' purchase intentions for the products. The study revealed that health consciousness, environmental consciousness and appearance consciousness had a positive influence on consumers' attitude towards organic personal care products.

A study by Tiwari(2016) shows that there has been a change in consumer attitude towards a green lifestyle. Because of the more awareness on different environmental problems, the lifestyle of consumers has changed a lot.

III. RESEARCH METHODOLOGY:

3.1 Significance of Study: This paper attempts to understand the preference of consumers towards green products, The study is descriptive in nature and is based on primary data collected from different cities of India. A well questionnaire was prepared and the response was collected from potential buyers of green products. The respondents from different demographic characteristics are taken as shown in Table 3.1.

3.2: Objectives of Study: The paper aims to achieve the following objectives:
1. To understand how the various parameters affecting consumer's preference are related.
2. To discuss and implement the use of various statistical tools for analyzing data.
3. To interpret the analyzed data.

3.3 Method of Data Collection: The study is based on primary data collected by a well structured questionnaire. It was administered to people in of age more than 18. The sample size for the study was 155. These respondents were from different cities, small and metros both. These included Business men/women, Service people, home makers, students. The Table 3.1 shows the demographic characteristics of the respondents who participated in the study.

Table 3.1: Demographic Characteristics of the respondents

| Characteristics	Range	Number of people	Percentage
Age	18 -25	58	37.4
	26-35	33	21.3
	36-45	34	21.9
	46-55	23	14.9
	56 and above	7	4.5
	Total	**155**	**100**
Gender	Male	67	56.8
	Female	88	43.2
	Total	**155**	**100**
Occupation	Professional	22	14.2
	Business	17	11.0
	Service	51	32.9
	Home Maker	15	9.7
	Student	50	32.2
	Total	**155**	**100**
Monthly Income	Less than 20000	29	18.7
	20001- 50000	28	18.1
	50001-80000	39	25.2
	80001-110000	32	20.6
	More than 110000	27	17.4
	Total	**155**	**100**

IV DATA ANALYSIS AND RESULTS:

4.**1 The Source of information about the Green Products:** In response to a question about the source of information, most of the people mentioned Television/advertisements (see table 4.1). Newspaper/Magazine is the next popular source for the information about green products. The contingency table can be prepared using pivot table in MS-Excel. The Contingency table 4.1 and Figure 4.1 shows the details of the source of information age wise.

Table 4.1: Source of Information about the Green Products

Source of Information	Age (years)					Total
	18-25	26-35	36-45	46-55	56 and above	
Brand Promotions	4	7	7	8	3	29
Newspaper/Magazines	12	5	7	5	2	31
Part of curriculum	9	3	3	0	0	15
Television/Advertisements	16	13	8	4	0	41
Word of mouth	9	4	5	6	2	26
World wide web(Internet)	8	1	4	0	0	13
Total	58	33	34	23	7	155

Figure 4.1: Frequency Distribution of Source of Information (age wise)
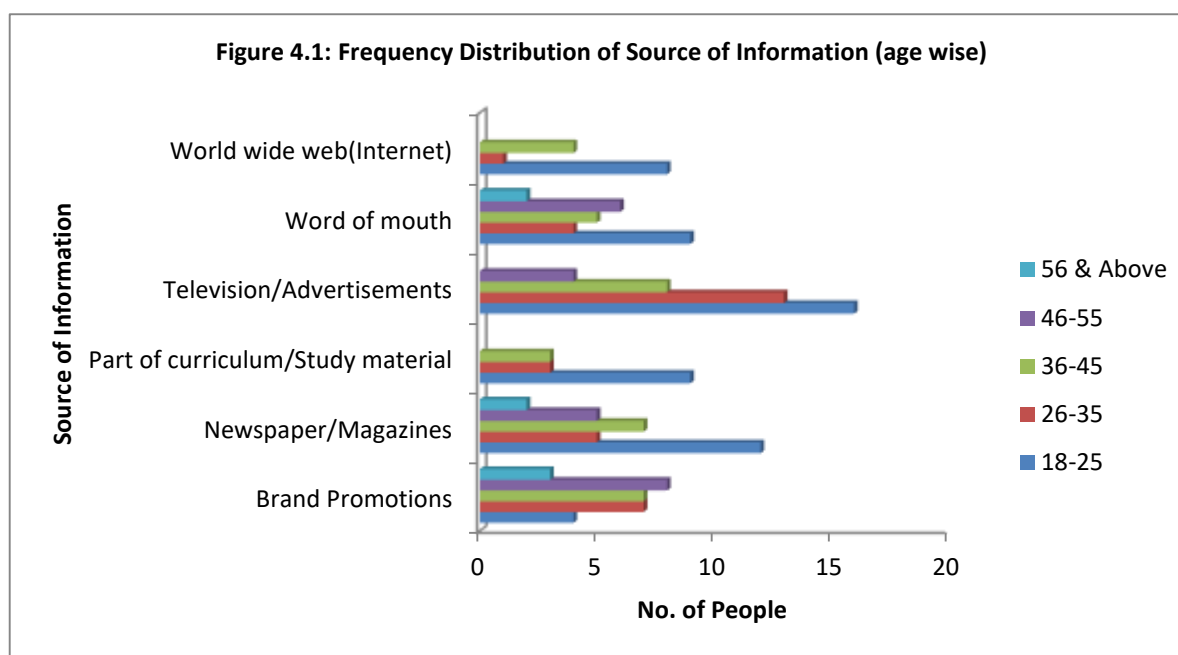
4.2. Reasons for Green Marketing attracting headlines: In response of this question, it is observed that according to most of the males (around 41 %), the reason is 'Companies are trying to increase their competitive edge' whereas most of the female (around 40%) think the reason is 'Increasing consumer awareness'. See Table 4.2 for more details.

Table 4.2: Reasons for Green Marketing attracting headlines Gender wise

Reason	Male	Female	Total
Companies are trying to increase their competitive edge	33	27	60
Company's attempt to address society's new concern	14	12	27
Increasing consumer awareness	36	22	58
Tap market for green products	5	5	10
Total	88	67	155

4.3 Readiness to pay more: In response to the question 'If green features increase the price of the product, are you willing to pay more?' the following observations are obtained. Table 4.3a is a contingency table showing the response of people and their Income. In order to find whether there is any association between the response of consumers and their monthly income, Chi-square test of Independence s performed.

This test is used to analyse the frequencies of two variables with multiple categories to determine whether the two variables are independent, see Black (2013). In the present study, Income is one variable and the response on readiness to pay more is another variable. This test will establish whether the association as observed in contingency table 4a is purely a chance or whether it reflects a genuine association between the two variables in the populations from which the sample data is drawn, Trevor (2013). The Null and Alternative hypothesis denoted by H0 and H1 respectively is given by

H0: There is no association between the Income and consumer's readiness to pay more.
H1: There is association between the Income and consumer's readiness to pay more.

The Chi square test statistics is defined as

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(f_0 - f_e)^2}{f_e} \qquad (3.1)$$

where r is the number of rows, c is the number of columns, f_0 is the observed frequency and f_e is the expected frequency. Here, r= 5 and c = 2. The degree of freedom = (r-1) * (c -1) = 4 * 1 = 4. From the Statistical Tables, the critical value of chi-square, for α = 0.05 and 4 degree of freedom is 9.49.

This value can be obtained in MS-Excel using the function CHIVNV(probability, deg_freedom). Select a cell in MS-Excel, and type =CHIINV(0.05,4) gives 9.49. The decision rule is to reject null hypothesis if the observed chi-square is greater than the critical value.

Table 4.3a: Readiness to pay more Income wise

Monthly Income	Response		Total
	Yes	No	
<20,000	13 (17.4)	16 (11.6)	29
20,000-50,000	12 (16.8)	16 (11.2)	28
50,000-80,000	30 (23.4)	9 (15.6)	39
80,000-1,10,000	22 (19.2)	10 (12.8)	32
Above 1,10,000	16 (16.2)	11 (10.8)	27
Total	93	62	155

The values written in bracket ( ) are the expected frequencies fe, and the one without ( ) are the observed frequencies. The expected frequencies corresponding to each observed value is calculated as the row total * Column total/grand total. Using formula 3.1, the observed chi-square statistic is found as 11.89 which is more than the critical value of chi-square statistic (9.49). Hence the decision is to reject H0.

One cam also conclude using p-value. In MS-Excel, the function CHIDIST(x, degree_freedom) is used to find p-value. So, in above case, if we use the formula =CHIDIST(11.89,4), we get p-value as 0.018188277. Since this value is less than 0.05, the decision is to reject H0. This shows that there is no association between the Income and consumer's readiness to pay more.

In order to check whether the response of consumers on readiness to pay depends on the gender, the following contingency table 4.3b is obtained.

Table 4.3b: Readiness to pay more Gender wise

Gender	Yes	No	Total
Female	51	37	88
Male	45	22	67
Total	96	59	155

The Null and Alternative hypothesis denoted by H0 and H1 respectively is given by

H0: The consumer's readiness to pay more is independent of Gender.
H1: The consumer's readiness to pay more is not independent of Gender.

Here, r= 2 and c = 2. The degree of freedom = (r-1) * (c -1) = 1 * 1 =1.The critical value of chi-square is for α = 0.05 and 1 degree of freedom is CHIINV(0.05,1)= 3.841. As the method discussed above, the observed chi-square statistic is calculated as 1.3685 which is less than the critical value of chi-square statistic. The decision rule is to not reject null hypothesis. In this case, the p-value is 0.24206991, which is more than 0.05, so H0 may not be rejected. This shows that the two parameters, gender and the response in readiness to pay more are independent of each other.

4.4 **Reasons for buying their favorite brand**: In response to the question "What is the main reason for buying your favorite brand?", most of the respondent (41.18% of the total)said 'Quality'. After that Brand name (18.38%), Easy availability (16.18%), environment friendly products (13.24%) comes. The response of male and female are almost similar on these particular phenomena.

Table 4.4: Reasons for buying your favorite brand Gender wise

Reason	Female	Male	Total
Brand Name	17.72%	19.30%	18.38%
Easy Availability	15.19%	17.54%	16.18%
It sells environment friendly products	15.19%	10.53%	13.24%
Price	8.86%	5.26%	7.35%
Quality	39.24%	43.86%	41.18%
Social initiatives undertaken by the Company	3.80%	3.51%	3.68%
Total	100.00%	100.00%	100.00%

4.5 **Marketing element influencing to buy:** In response to the question "Which is the most influencing marketing element to buy ?", the following response is obtained. :It can be observed from the figures that the most influencing element in buying a product is the 'promotion'. The product itself comes next to the promotion as 25.16% of the total respondent finds the product as the most influencing marketing element. In comparison to 'Price' and 'package', the opinion of Female and male differ here.

Table 4.5: Marketing element influencing the user to buy (gender wise)

Reason	Female	Male	Total
Promotion	31.82%	43.28%	36.77%
Product itself	26.14%	23.88%	25.16%
Price	9.09%	7.46%	8.39%
Place(Ease of location/availability)	2.27%	7.46%	4.52%
Package	11.36%	4.48%	8.39%
All of the above	19.32%	13.43%	16.77%
Grand Total	100.00%	100.00%	100.00%

4.6 Information about green features: In response to the question "There is enough information about 'green features' when you buy a product", the following response was obtained:

Table 4.6a: Response on Information about green features

Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
60	6	5	11	73	155

In the above table 4.6a, the distribution of responses is bimodal. That is, two peaks exist in the distribution. Data transformation is the process of changing the data from their original form to a format suitable for performing a data analysis that will achieve research objectives (Zikmund et.al.(2013).. In one such method a Likert scale may sometimes be collapsed into a smaller no. of categories.

Here (60+73)/155 = 85.81 percent indicate either strongly agree or disagree with the statement. Hence, the responses can be collapsed into two categories. One, where responses agree or strongly agree (60+6 = 66) and two , where responses disagree or strongly disagree (73+ 11 = 84). Responses responding neutral would be deleted from the analysis. See Zikmund et.al.(2013) for more details. Hence the responses are shown in table 4.6b.

Table 4.6b: Response on Information about green features

	Agree (category 1)	Disagree (Category 2)	Total
There is enough information about "green features" when you buy a product	66	84	150

 Hence, it can be concluded that most of the people (56% of the total no. of respondents) feel that there is not enough information about the green features, when they buy the product.

V. Conclusion:

The study reveals the fact that people are considerably well aware of green products, but not loyal entirely towards it due to a host of factors like price, not much difference when compared to traditional products in terms of performance and quality. It is observed that because of the companies trying to increase their competitive edge and the increasing consumer awareness, green marketing is attracting headlines. People are ready to pay more if green features increase the price of the product. By applying Chi-square test, it was found that the readiness to more is depending on the income of people and is independent on gender.

The promotion and the product itself are the main marketing elements influencing to buy. However, the opinion of male and female differ for the two elements which are price and package. It is found that male find price as more influencing than package and female find package as more influencing than price. It is observed that, when they buy a product, most of them feel that there is not enough information about the green features.

References:

[1] Ali A., Khan A.A., Ahmed I and Shahzad W. (2011), **"**Determinants of Pakistani Consumers' Green Purchase Behavior: Some Insights from a Developing Country", International Journal of Business and Social Science, Vol.2, No. 3, 217-226.

[2] Alwit, L.F. and Berger, I.E.(1993), "Understanding the Link Between Environmental Attitudes and Consumer Product Usage: Measuring the Moderating Role of Attitude Strength", Advances in Consumer Research, Vol.20, 189-194.

[3] Black, Ken (2013) "Applied Business Statistics", Wiley India.

[4] Das, J.K.(2002), :Responding to Green Consumers: The Roles for Government and Business", Vikalpa, Vol.27, No..1, 3-12.

[5] Follows, S.B. and Jobber, D.(2000), " Environmentally Responsible Purchase Behavior: A test of a Consumer Model", European Journal of Marketing, Vol. 34, No. 5/6, 723-746.

[6] Kim, H.Y. and Chung, J. (2011). "Consumer Purchase Intention for Organic Personal Care Products", Journal of Consumer Marketing, Vol. 28, Bo.1,40-47.

[7] Palodinn, A. and Baggiere, J. (2008), "Are we Green? An Empirical Investigation of Renewable Electricity Consumption", European Advances in Consumer Research, Vol.8,340-341.

[8] Peattie, Ken (2001) Towards Sustainability: The Third Age of Green Marketing ,The Marketing Review, Vol. 2, 129-146

[9] Tiwari Jaya (2016),"Green Marketing in India: an Overview", JOSR Journal of Business and Management (JOSR-JBM), e-ISSN: 2278-487X,p-ISSN:2319-7668,33-40.

[10] Trevor Wegner (2013). Applied Business Statistics, Methods and Excel-Based Applications, Juta and Company Ltd.

[11] Zikmund, William G. Barry J. Babin, Jon C. Carr, Atanu Adhikari, Mitch Griffin (2013), Business Research Methods A South Asian Perspective, Cengage Learning