

CONSUMER PERCEPTION AND ATTITUDES TOWARDS GREEN CARS

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ABSTRACT:

The paper looks into the consumer perception and attitudes towards green cars. A questionnaire was designed with a sample size of 157 in area of Mumbai. The objectives of research is to determine perception of Green Cars in the minds of the average Indian Consumer, to ascertain the attitudes of people towards alternatively fueled vehicles and to ascertain the qualities that consumers look for in a green car . The analysis was done keeping parameters like Age, Sex, Education, Annual Family Income and Car usage. The research shows some interesting facts which could have a great importance to the manufacturer of a green car. Most of the respondents agree that green cars would replace conventional cars but the age group which felt the most was the age group of 33-43 years of age group. People with higher education such as post graduates understood the relevance of green cars more than other people.

Keywords:-Green Cars, Consumer Perception, Hybrid cars

INTRODUCTION

A green vehicle or environmentally friendly vehicle is a road motor vehicle that produces less harmful impacts to the environment than comparable conventional internal combustion engine vehicles running on gasoline or diesel, or one that uses certain alternative fuels. Green vehicles can be powered by alternative fuels and advanced vehicle technologies and include hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, compressed-air vehicles, hydrogen and fuel cell vehicles, neat ethanol vehicles, flexible-fuel vehicles, natural gas vehicles, clean diesel vehicles, and some sources also include vehicles using blends of biodiesel and ethanol fuel or gasohol. Several author also include conventional motor vehicles with high fuel economy, as they consider that increasing fuel economy is the most cost-effective way to improve energy efficiency and reduce carbon emissions in the transport sector in the short run. As part of their contribution to sustainable transport, these vehicles reduce air pollution and greenhouse gas emissions, and contribute to energy independence by reducing oil imports.

The interest in commercial electric and hybrid vehicles, as the case for their light vehicle counterparts, is driven by the volatility of petroleum fuel costs, efforts to improve energy security, concerns about both toxic and greenhouse emissions and an associated range of incentives that are now in place at national and local government levels. However, the barriers to mass-market uptake are numerous and significant. Although various incentive schemes can assist, the capital costs of the new technologies are high and, in some cases, fuel savings have not so far adequately off-set increased capital and operating costs. Furthermore, the electric-only operating range of electric and plug-in hybrid-electric vehicles remains a concern for consumers and the necessary recharging infrastructure is only in the early stages of development. Nevertheless, there are now many commercial electric and hybrid vehicles available in the market and the intense levels of research, development and investment in enabling technology and new vehicle production will no doubt result in many more during the next few years.

In this report, 'electric vehicle' refers to a purely battery-powered vehicle while 'hybrid' refers to hybrid-electric and hybrid-hydraulic vehicles. Hybrid-electric vehicles with the capacity to recharge their batteries from an external source are referred to as 'plug-in' hybrids.

TYPES OF GREENS CARS

Green vehicles include vehicles types that function fully or partly on alternative energy sources other than fossil fuel or less carbon intensive than gasoline or diesel.

Another option is the use of alternative fuel composition in conventional fossil fuel-based vehicles, making them function partially on renewable energy sources. Other approaches include personal rapid transit, a public transportation concept that offers automated, on-demand, non-stop transportation on a network of specially built guideways.

Electric and fuel cell-powered

Examples of vehicles with reduced petroleum consumption include electric cars, plug-in hybrids and fuel cell-powered hydrogen cars. Electric cars are typically more efficient than fuel cell-powered vehicles on a wheel-to-wheel basis. For this reason, battery powered vehicles and plug-in hybrids are gaining popularity. They have better fuel economy than conventional internal combustion engine vehicles but are hampered by range or maximum distance attainable before discharging the battery. The electric car batteries are their main cost. They provide a 55% to 99.9% improvement in CO₂ emissions compared to an internal combustion engine (gasoline, diesel) vehicle, depending on the source of electricity.

1. A battery electric vehicle (BEV) is a type of electric vehicle (EV) that uses chemical energy stored in rechargeable battery packs. BEVs use electric motors and motor controllers instead of internal combustion engines (ICEs) for propulsion. A battery-only electric vehicle or all-electric vehicle derives all its power from its battery packs and thus has no internal combustion engine, fuel cell, or fuel tank.
2. A Fuel cell vehicle or Fuel Cell Electric Vehicle (FCEV) is a type of hydrogen vehicle which uses a fuel cell to produce electricity, powering its on-board electric motor. Fuel cells in vehicles create electricity to power an electric motor using hydrogen and oxygen from the air. All fuel cells are made up of three parts: an electrolyte, an anode and a cathode. In principle, a hydrogen fuel cell functions like a battery, producing electricity, which can run an electric motor. Instead of requiring recharging, however, the fuel cell can be refilled with hydrogen.

Hybrid electric vehicles

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The term most commonly refers to hybrid electric vehicles (HEVs), which combine an internal combustion engine and one or more electric motors. Hybrid cars may be partly fossil fueled and partly electric or hydrogen-powered. They are more expensive to purchase but cost redemption is achieved in a period of about 5 years due to better fuel economy.

Compressed air cars, stirling vehicles, and others

Compressed air cars, stirling-powered vehicles, Liquid nitrogen vehicles are even less polluting than electrical vehicles, as the vehicle and its components can be made more environmentally friendly.

Solar car races are held on a regular basis in order to promote green vehicles and other "green technology". These sleek driver-only vehicles can travel long distances at highway speeds using only the electricity generated instantaneously from the sun.

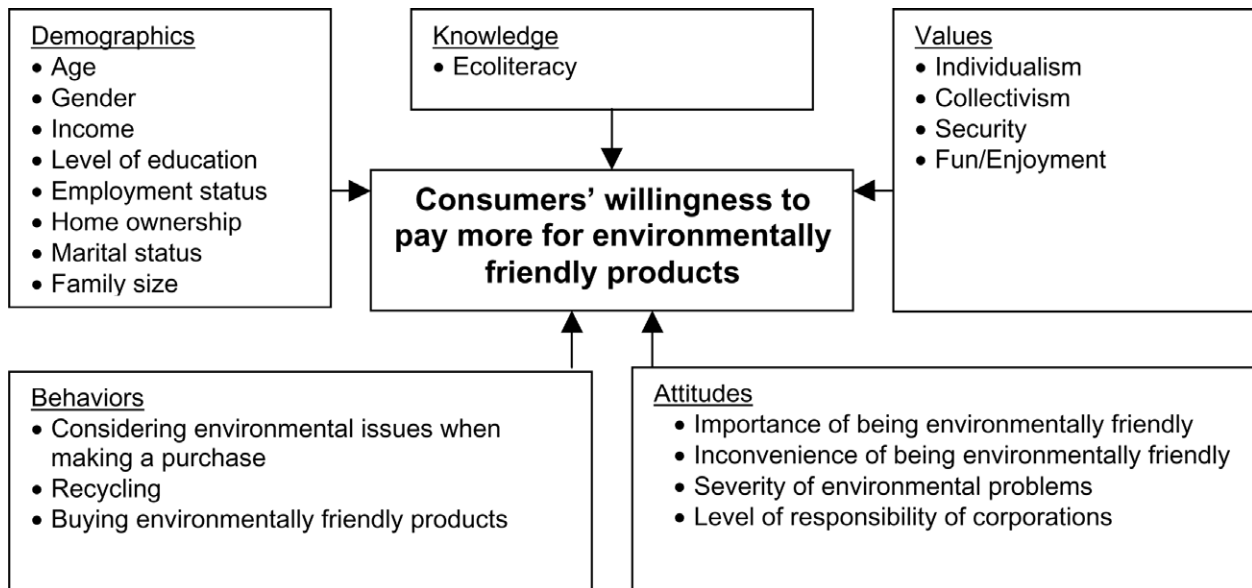
LITERATURE REVIEW

As the environment continues to worsen, the consumer has begun to realize the seriousness of the problem. Based on the needs of the consumer, businesses should design green products to match the customers' demands. Green cars are powered by alternative fuels and advanced vehicle technologies and include hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, compressed-air vehicles, hydrogen and fuel-cell vehicles, neat ethanol vehicles, flexible-fuel vehicles, natural gas vehicles, clean diesel vehicles, and some sources also include vehicles using blends of biodiesel and ethanol fuel or gasohol(US department of energy, 2010). The Theory of Planned Behavior was developed in response to a related existing model—The Theory of Reasoned Action (TRA) (Ajzen, 1988, 1991). Briefly, the Theory of Reasoned Action (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) places intention as the principal predictor of behavior. So conceived, the more one intends to engage in behavior, the more likely is the occurrence of the behavior. Determining intention are attitude and subjective norm. The attitudinal determinant of intention is defined as the overall evaluation of behavior. This overall evaluation, in turn, is composed of the salient beliefs: the perceived likelihood of particular consequences of the behavior occurring, weighted by an evaluation of the consequences. The subjective norm determinant of attitude is conceptualized as social pressure from significant others to perform or not perform the behavior. The subjective norm, in turn, is composed of

normative beliefs: the perceived pressure from salient referents, weighted by the motivation to comply with the referents. The TRA has received support across a range of contexts (Sheppard, Hartwick, & Warshaw, 1988). A recognized limitation of the TRA is that it was developed to deal with behaviors that are completely under an individual's volitional control (Ajzen, 1988; Fishbein, 1993). Figure 1 is the structure of TRA.

Attitude + Structure Norms = Behavior intention = Actual Acts

Efforts to identify environmentally friendly consumers can be traced back to the early 1970s. Berkowitz and Lutterman (1968), as well as Anderson and Cunningham (1972), were pioneers in studying the profile of socially responsible consumers.



The results of Berkowitz and Lutterman (1968) and Anderson and Cunningham (1972) were sometimes supported, but often not. For example, recent studies found that females tend to be more ecologically conscious than men (McIntyre *et al.*, 1993; Banerjee and McKeage, 1994). However, Reizenstein *et al.* (1974) found that only men were willing to pay more for control of air pollution, and Balderjahn (1988) reported that the relationship between environmentally conscious attitudes and the use of non-polluting products was more intensive among men than among women.

Following Berkowitz and Lutterman's (1968) study, Henion (1972) also thought that consumers with medium or high incomes would be more likely to act in an ecologically compatible manner

due to their higher levels of education and therefore to their increased sensitivity to social problems.

However, the results did not support his hypothesis: environmentally friendly behavior was consistent across income groups. Moreover, Sandahl and Robertson (1989) found that the environmentally conscious consumer is less educated and has a lower income than the average American. This brought them to conclude that income and education are not good predictors of environmental concern or purchase behavior. On one hand, Maloney and Ward (1973) reported no significant linkage between environmental knowledge and ecologically compatible behavior. On the other hand, Vining and Ebreo (1990), as well as Chan (1999), have shown that knowledge about ecological issues is a significant predictor of environmentally friendly behavior. Amyx *et al.* (1994) even found that individuals highly knowledgeable about environmental issues were more willing to pay a premium price for green products.

Ecoliteracy was developed by Laroche *et al.* (1996) to measure the respondent's ability to identify or define a number of ecologically-related symbols, concepts and behaviors. It was found to be correlated with some attitudes and behavior towards the environment. According to Triandis (1993), two major values that influence consumer behavior are individualism and collectivism. On one hand, individualism represents how much a person focuses on his/her independent self (i.e. how he/she depends only on himself or herself). Individualist people engage in voluntary associations and they make sure that they remain distinct individuals, even when they belong to groups. They also compete with others for status, which depends on their accomplishments much more than on their group memberships (Triandis, 1993). We suspect that this type of individual is not very conducive to environmental friendliness. On the other hand, collectivism implies cooperation, helpfulness, and consideration of the goals of the group relative to the individual. Being a collectivist means that one may forego individual motivations for that which is good for the group. The work of Triandis (1993) and McCarty and Shrum (1994) suggest that collectivist people tend to be friendlier to the environment, while individualistic people tend to be more unfriendly. In addition, McCarty and Shrum (1994) investigated the impact of two other relevant values on consumers' environmentally conscious behavior: fun/enjoyment and security. It was found that the fun/enjoyment value was positively related to attitudes about the importance of recycling and to the recycling behavior. This relationship makes sense if one considers that those who value fun and enjoyment in life may see a

fulfillment of this end-state through interaction with the environment. The security value factor was not significantly related to either the importance of recycling or the recycling behavior. The two most studied attitudes in the ecological literature, with respect to environmentally friendly behavior, are importance and inconvenience. Amyx *et al.* (1994) define perceived importance, with respect to the environment, as the degree to which one expresses concern about ecological issues. In other words, importance is simply whether consumers view environmentally compatible behaviors as important to themselves or society as a whole. Inconvenience refers to how inconvenient it is perceived for the individual to behave in an ecologically favorable fashion. For example, a person may feel that recycling is important for the long-run good of the society, but he or she may also feel that it is personally inconvenient. Similarly, a consumer may know that single-serve aseptically packaged juices or puddings will harm the environment, but still buy them because they are convenient. Laroche *et. al.* (1996) reveals that the strength of the relationships between attitudes and consumers' willingness to spend more for green products. The attitude that showed the most discriminating power between the two segments of consumers is the perceived inconvenience of being environmentally friendly. This study reveals that consumers willing to pay more for green products did not perceive it inconvenient to behave in an ecologically favorable manner. The opposite was found for the unwilling respondents. Therefore, it is of primary importance for marketers to advertise why it is convenient to purchase green products and to change consumer perceptions in a positive way. According to Michniak *et. al.* a majority of consumers indicate that 3rd party certification would increase their trust of environmental claims.

OBJECTIVES

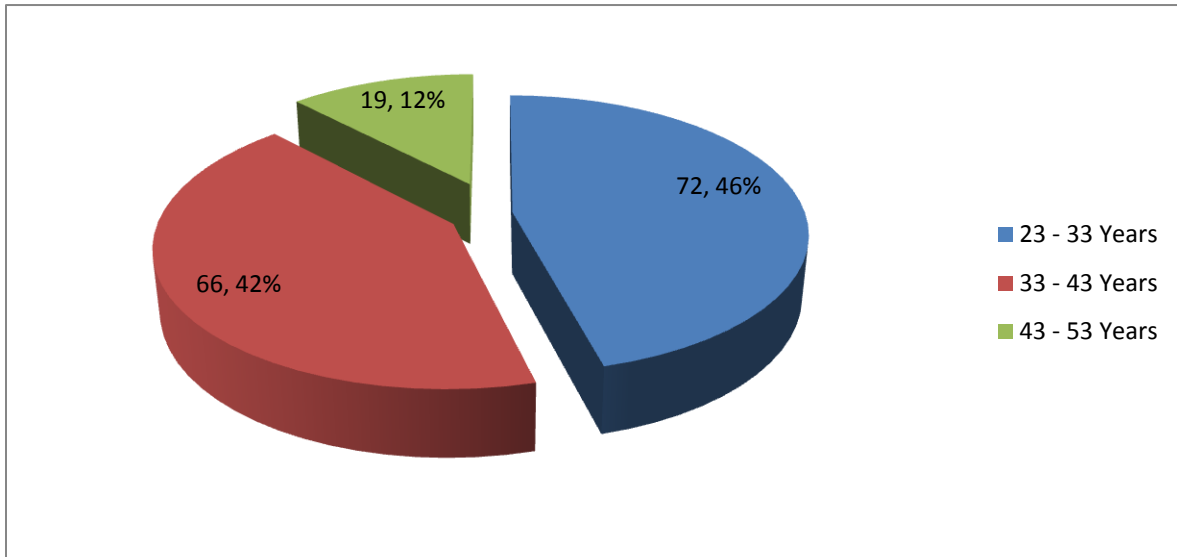
1. To determine perception of Green Cars in the minds of the average Indian Consumer
2. To ascertain the attitudes of people towards alternatively fueled vehicles
3. To ascertain the qualities that consumers look for in a green car

RESEARCH DESIGN

Data Source	Primary data source- Questionnaire Secondary data source- Internet
Sampling area	Mumbai
Sample size	157
Research instrument	Questionnaire
Method of contact	Personal

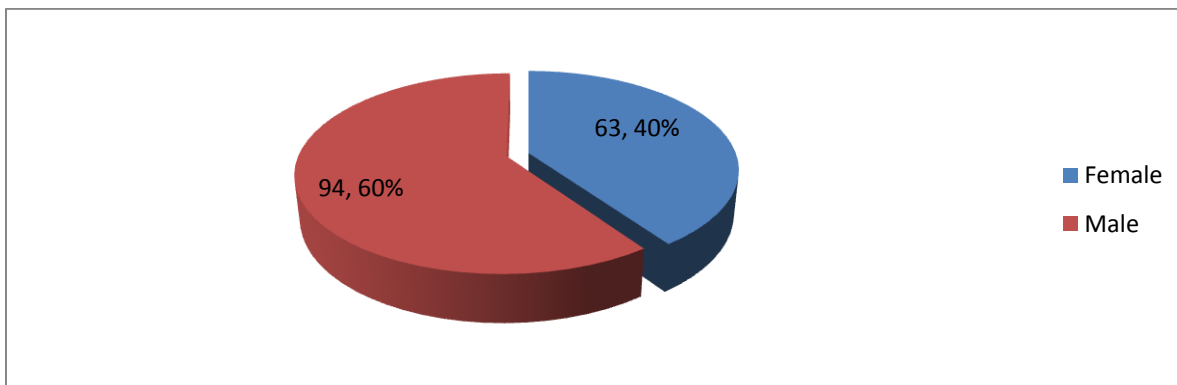
DATA ANALYSIS

I. Age of the Respondents



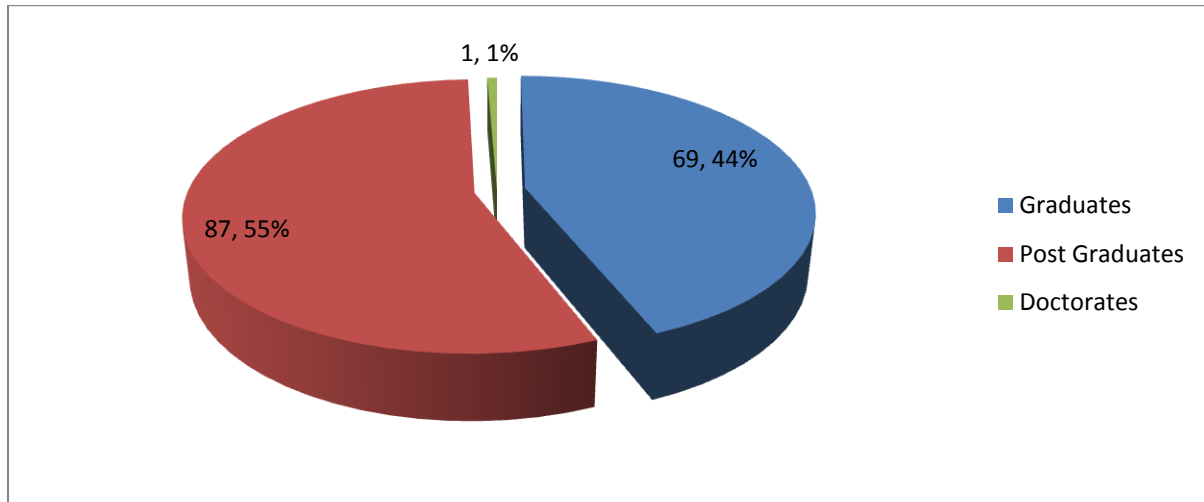
A total of 157 respondents were surveyed for the Consumer perception towards Green cars. Out of the respondents surveyed 72 were in the age group of 23 – 33 years, 66 respondents were in the age group of 33 – 43 years and 19 respondents were in the age group of 43 – 53 years. Thus it can be inferred that collectively 88% of the respondents were in the age group of 23 – 43 years indicating most respondents were young.

II. Gender of the Respondents



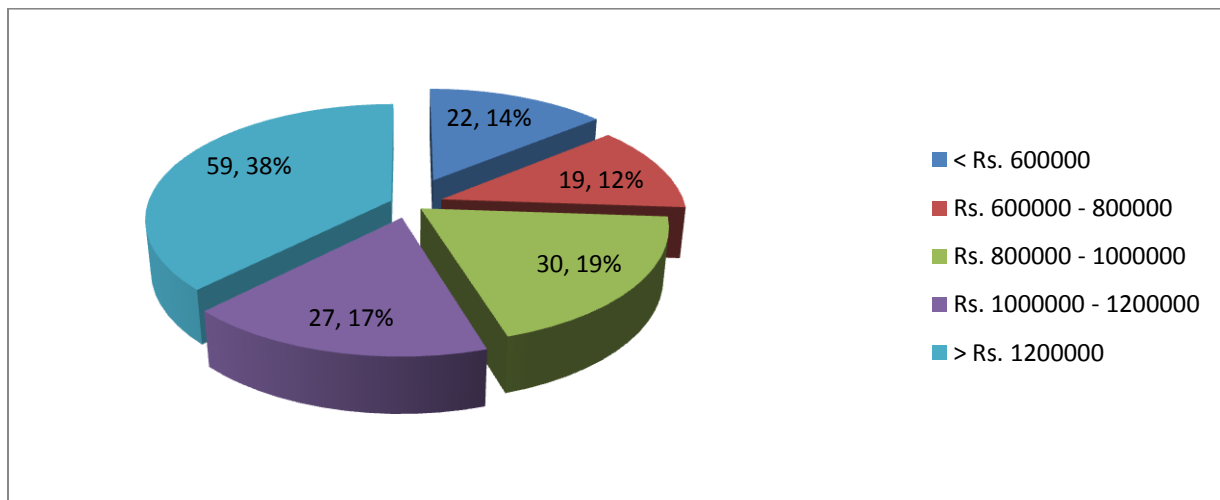
Out of the respondents surveyed 94 were males while 63 respondents were females. Thus it can be inferred that there is a balance in the sex of the number of respondents surveyed.

III. Education of the Respondents



Out of the respondents surveyed 69 were Graduates, 87 respondents were Post Graduates and 1 respondent was Doctorate. Thus it can be inferred that there is a balance in the number of Graduates and Post Graduates surveyed.

IV. Annual Income of the Family



Out of the respondents surveyed 22 had an annual income less than Rs. 600,000. 19 respondents had an annual income of Rs. 600,000 – 800,000. 30 respondents had an annual income of Rs. 800,000 – 1,000,000. 27 respondents had an annual income of Rs. 1,000,000 - 1,200,000 while 59 respondents had an annual income greater than Rs. 1,200,000. Thus it can be inferred that a collective of 74% of the respondents have annual average income of more than Rs. 800,000 indicating disposable income available with families to purchase a car.

V. Age of the respondent Vs Green Cars replacing Conventional Cars over time

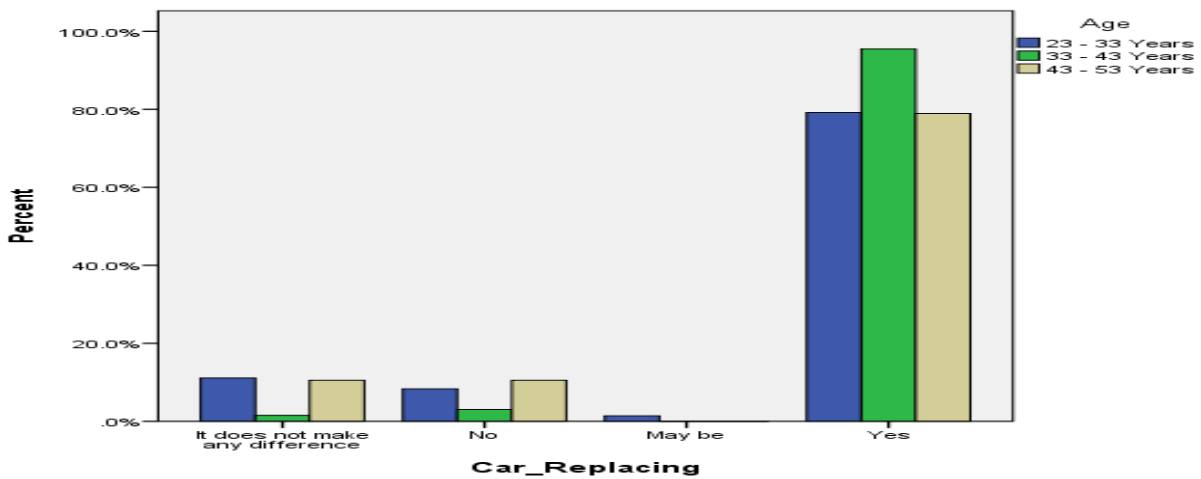
A test of Correlation was done for Age Vs Green car replacing the conventional cars over time to determine the relationship between the two parameters.

Hypothesis:

H0: The distribution of Green Cars replacing Conventional Cars over time is same across all categories of Age.

H1: The distribution of Green Cars replacing Conventional Cars over time is not same across all categories of Age.

3	The distribution of car replacing is same across all categories of age	Independent Samples Kruskal- Wallis Test 0.14	Reject the null hypothesis
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We reject the null hypothesis and state that the distribution of Green Cars replacing Conventional Cars over time is not same across all categories of Age. It is highest in the Age group of 33 – 43 Years. Also the highest number of respondents agreed that Green Car would eventually replace conventional cars.

VI. Age of the respondent Vs Understanding about Green Cars

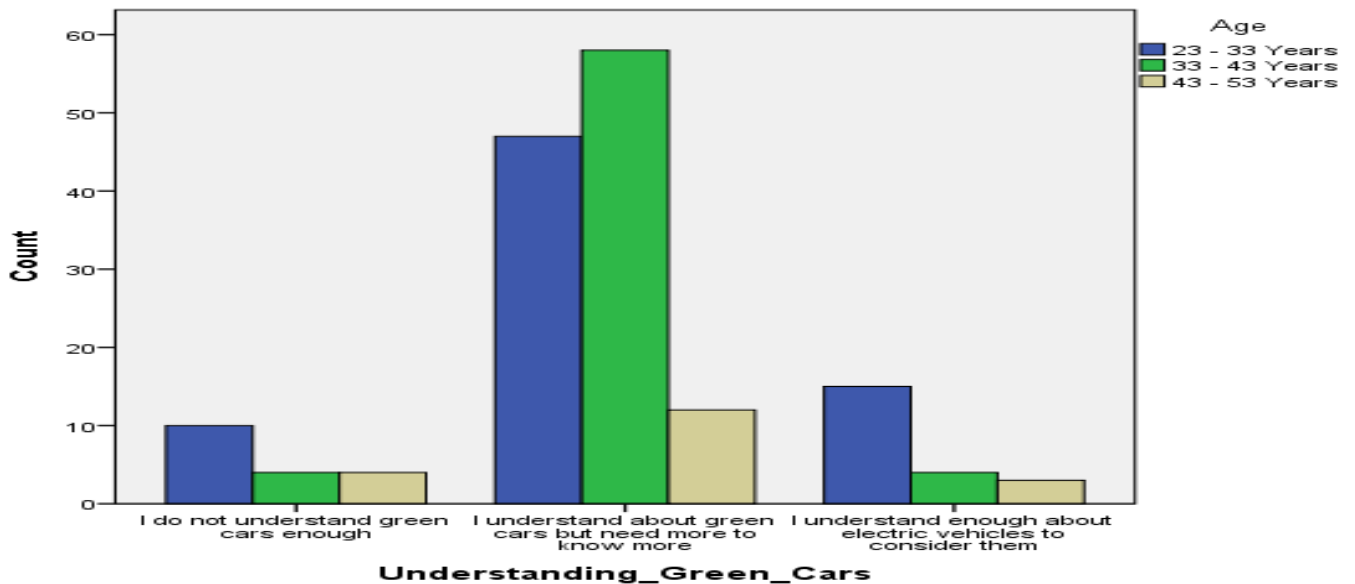
A test of Correlation was done for Age Vs Green car replacing the conventional cars over time to determine the relationship between the two parameters.

HYPOTHESIS

H₀: The distribution of understandings about Green Cars is same across all categories of Age.

H₁: The distribution of understandings about Green Cars is not same across all categories of Age.

2	The distribution of understanding green cars is same across categories of age	Independent Samples Kruskal -Wallis Test	.548	Retain the null hypothesis
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We accept the null hypothesis that the distribution of understandings about Green Cars is same across all categories of Age. It is highest in the category of more information required for the purchase of the Green Car.

Sex of the respondent Vs Price willing to pay for a Green Car

A test of correlation was done for Sex Vs Price willing to pay for a Green Car to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of price willing to pay is same across all males and females surveyed

H₁: The distribution of price willing to pay is not same across all males and females surveyed

5	The Distribution of Price Willing to pay is the same for both males and females	Independent Samples Mann- Whitney U Test .853	Retain the null hypothesis
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We accept the null hypothesis that the distribution of price willing to pay is same for males and females and it is highest in the category of Rs. 400000 - 600000.

VII. Sex of the respondent Vs Understanding about Green Cars

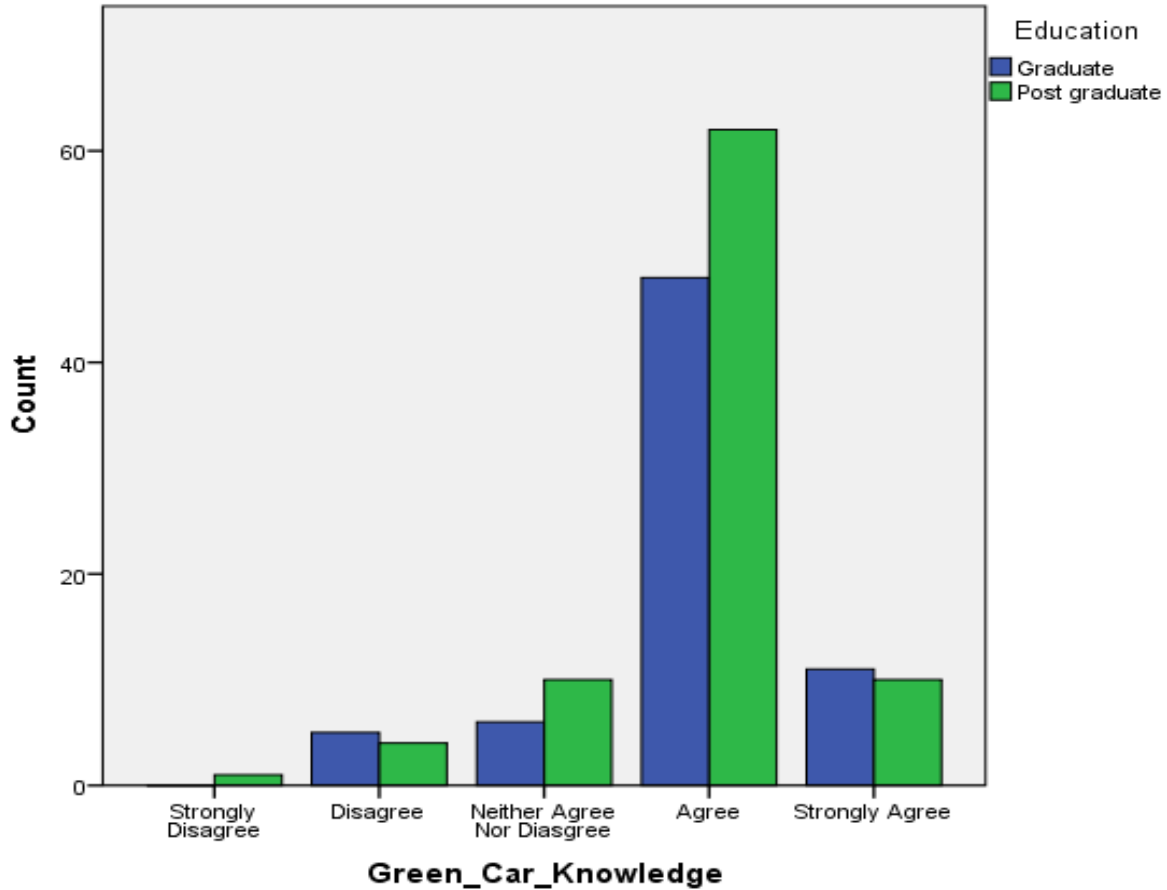
A test of correlation was performed between Sex & Understanding about Green Cars to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of Understanding about Green cars is same across males and females

H₁: The distribution of Understanding about Green cars is not same across males and females

2	The Distribution of understanding green cars is the same across both males and females	Independent – Samples Mann- Whitney U Test .239	Retain the null hypothesis
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Thus we retain the null hypothesis, but the significance is low. Overall males had a better understanding about Green Cars

VIII. Annual Income of the family Vs Consideration to buy a Green Car

A test of correlation was performed between annual income & consideration to buy a Green Car to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of the future consideration to buy an environmental friendly car is same across all categories of Annual Income.

H₁: The distribution of the future consideration to buy an environmental friendly car is not same across all categories of Annual Income.

4	The Distribution of future consideration is the same across categories of annual income.	Independent – Samples Kruskal -Wallis Test .976	Retain the null hypothesis
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Annual_Income * Future_Consideration Crosstabulation

Count

	Annual_Income	Future_Consideration			Total
		May be	Yes	No	
	< Rs. 600000	2 _a	7 _a	13 _a	22
	Rs. 600000 - 800000	1 _a	5 _a	12 _a	18
	Rs. 800000 - 1000000	1 _a	12 _a	18 _a	31
	Rs. 1000000 - 1200000	0 _a	11 _a	16 _a	27
	> Rs. 1200000	3 _a	22 _a	34 _a	59
	Total	7	57	93	157

We accept the null hypothesis that the distribution of the future consideration to buy an environmental friendly car is same across all categories of Annual Income. Thus as income increases the acceptance of is higher

IX. Annual Income of the family Vs Willingness to pay for a Green Car

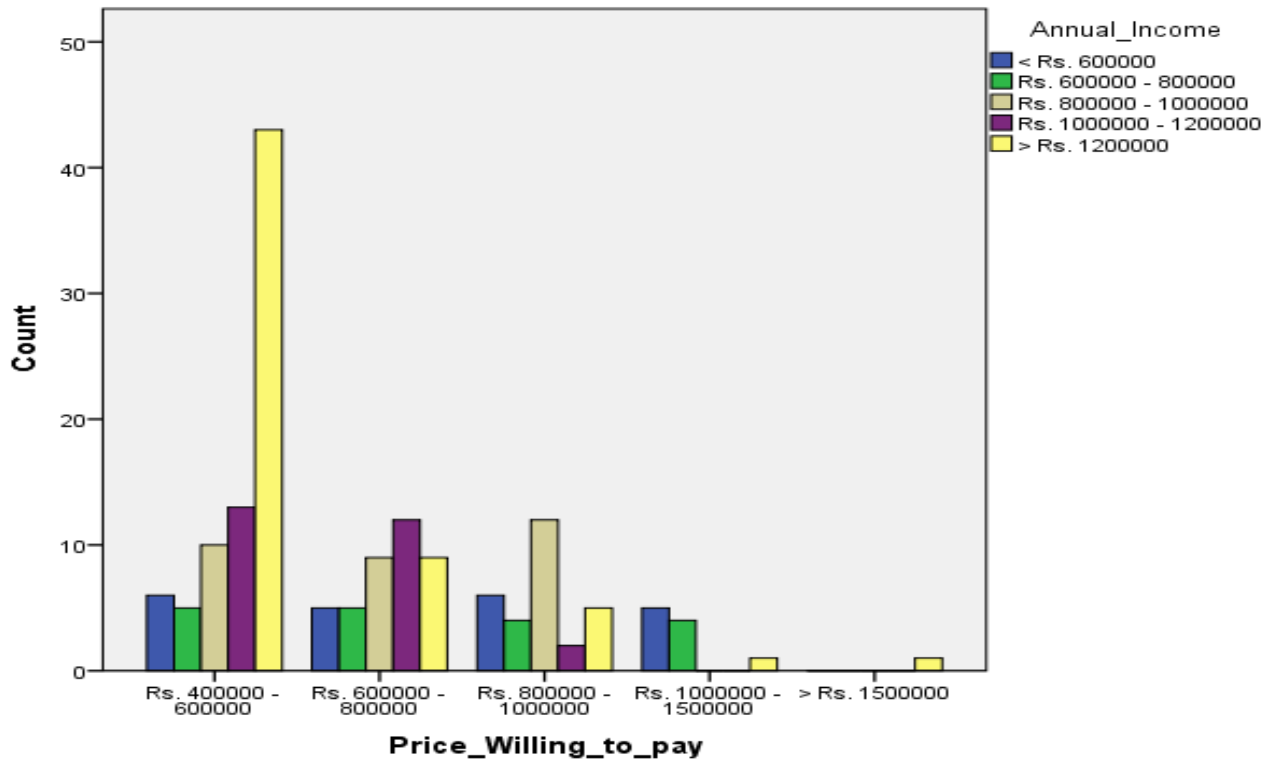
A test of correlation was performed between annual income & willingness to pay for a Green Car to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of willingness to pay for a Green Car is same across all categories of Annual Income.

H₁: The distribution of willingness to pay for a Green Car is not same across all categories of Annual Income.

5	The Distribution of willingness to pay is the same across categories of annual income.	Independent – Samples Kruskal -Wallis Test .000	Reject the null hypothesis
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We reject the null hypothesis that the distribution of price willing to pay for a Green Car is not same across all categories of Annual Income. Maximum numbers of respondents are willing to pay Rs. 400000 – 600000 for a Green Car.

X. Car Usage Vs Green Cars replacing Conventional cars

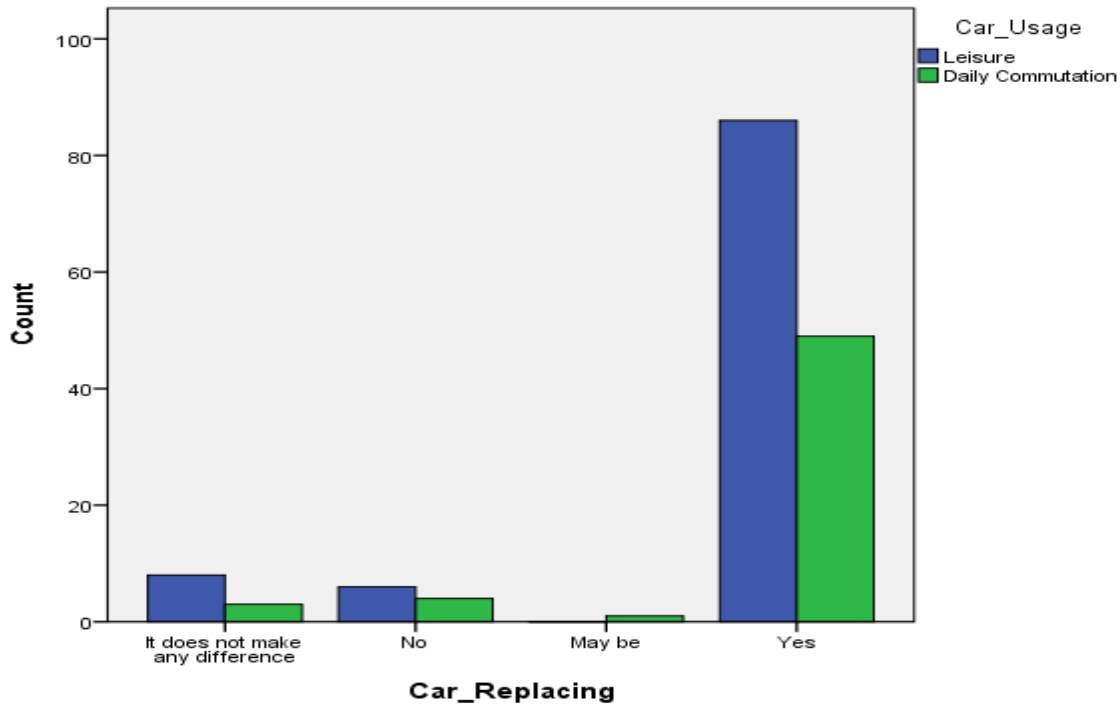
A test of correlation was performed between car usage & Green Cars replacing conventional cars to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of Green Cars replacing conventional cars over time is same across all categories of Car Usage.

H₁: The distribution of Green Cars replacing conventional cars over time is not same across all categories of Car Usage.

3	The Distribution of car relacing is the same across categories of car usage.	Independent – Samples Mann- Whitney U Test .937	Retain the null hypothesis
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We accept the null hypothesis that the distribution of Green Cars replacing conventional cars over time is same across all categories of Car Usage. The number of respondents whose car usage is Leisure believe that the over period of time conventional cars would be replaced by Green Cars.

XI. Car Usage Vs Knowledge of Green Cars

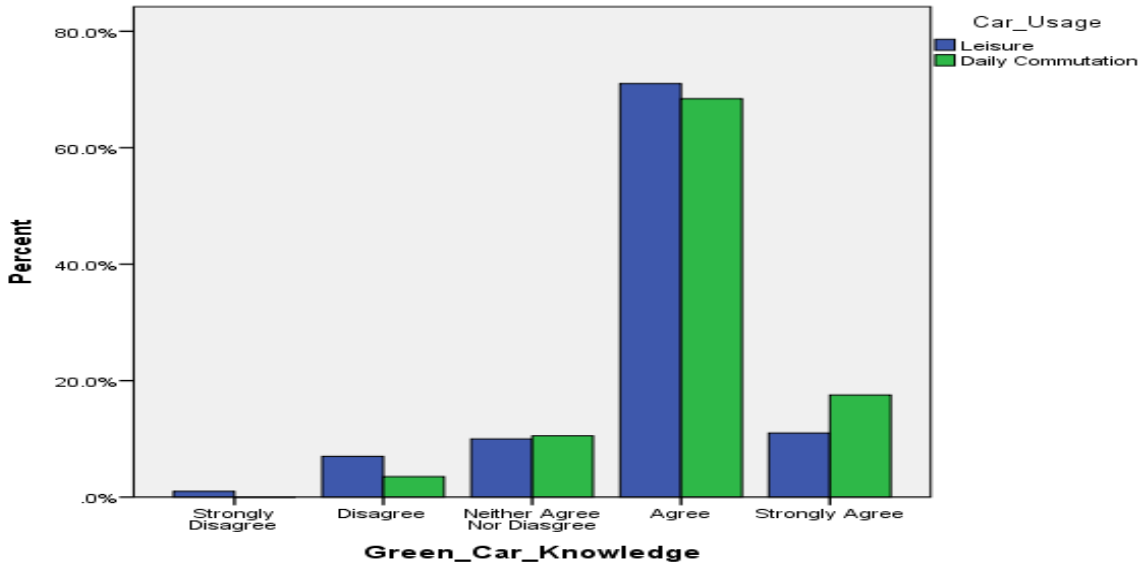
A test of correlation was performed between car usage & Knowledge of Green cars to determine the relationship between the two parameters.

Hypothesis:

H₀: The distribution of knowledge of Green Cars is same across all categories of Car Usage.

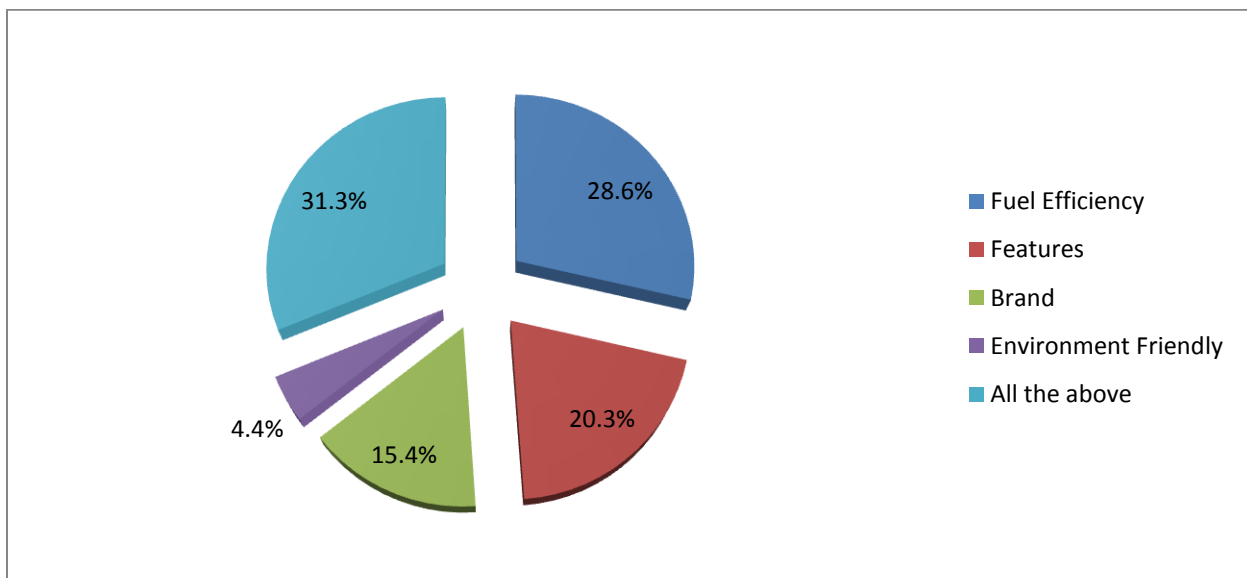
H₁: The distribution of knowledge of Green Cars is not same across all categories of Car Usage.

1	The Distribution of Green car knowledge is the same across categories of car usage.	Independent – Samples Mann- Whitney U Test .225	Retain the null hypothesis
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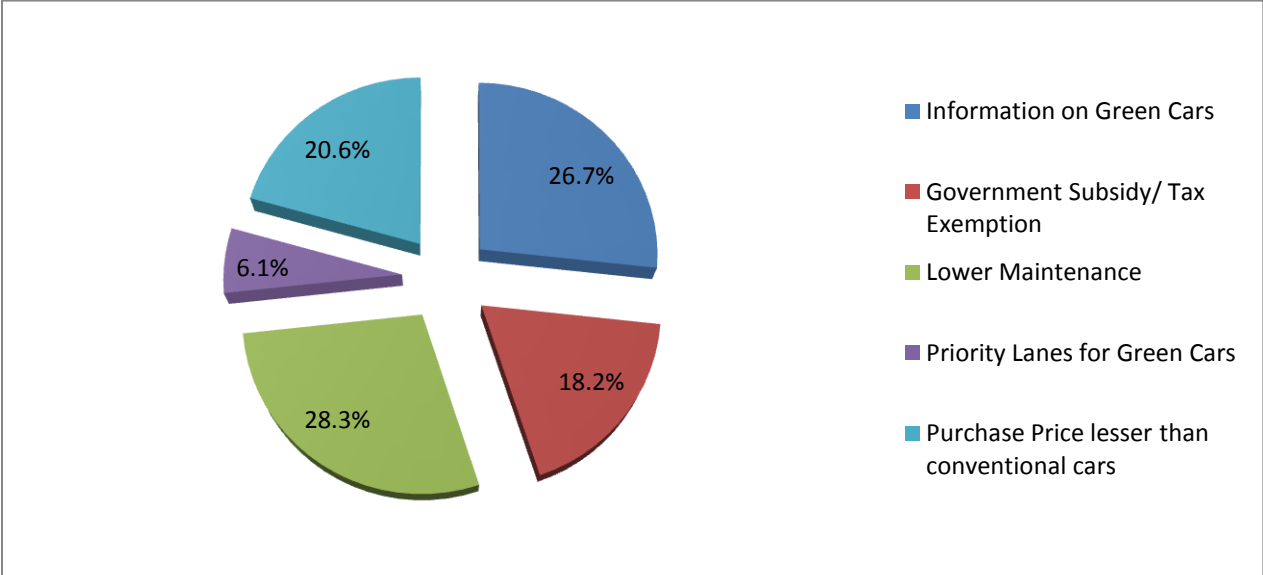
We accept the null hypothesis that the distribution of knowledge of Green Cars is same across all categories of Car Usage. Knowledge about Green cars is higher for users whose usage is Daily Commutation.

XII. Factors considered during purchasing a car



A total of 157 respondents were surveyed for the Consumer perception towards Green cars. Out of the respondents surveyed 31.3% of the respondents said they considered all the mentioned factors while purchasing a car, 28.6% respondents said Fuel Efficiency, 20.3% respondents said Features were an important factor while making the decision to purchase a car, 15.4% said the Brand was important and 4.4% of the respondents said the car being Environment Friendly was an important factor.

XIII. Motivators to purchase a green car



A total of 157 respondents were surveyed for the Consumer perception towards Green cars. Out of the respondents surveyed 28.3% of the respondents said they considered Lower Maintenance as a motivator to purchase a green car, 26.7% respondents said Information on Green cars, 20.6% respondents said purchase price lesser than a conventional car is a motivator to purchase a green car, 18.2% said Government subsidy or tax exemption was important and 6.1% of the respondents said priority lanes for green cars is a motivator.

CONCLUSION

The analysis was done keeping parameters like Age, Sex, Education, Annual Family Income and Car usage.

1. Age of the Respondent:

It was observed that age plays important criteria for the belief that distribution of Green Cars would replace Conventional Cars over time. Most of the respondents agree that the Green Car

would replace conventional cars but the age group of 33 – 43 years were in favour as against other age groups. Age was also an important criterion for the understanding of Green cars. Most respondents understand about Green car but they needed more information to make purchase decision.

2. Sex of the Respondent:

The parameter of price willing to pay for a Green Car was assessed against the sex of the respondent. It was observed that most of the respondents irrespective of their sex were ready to pay a price of Rs. 400000 – 600000. Also a number of respondents were unwilling to pay a high price.

The parameter of understanding of Green Cars was assessed against the sex of the respondent. It was observed that maximum number of respondents knew about green cars but needed more information to make a purchase decision. Also the number of males who are ready to buy is higher.

3. Education:

The parameter of Education was assessed against the understanding of green cars of an individual. The knowledge about green cars was higher for Post Graduates than graduates.

The parameter of Education was assessed against Green cars replacing conventional car over time. The number of Post Graduates who agree that Green cars would replace conventional cars over time is higher than Graduates.

4. Annual income of the family:

The parameter of Annual income of the family was assessed against future consideration to buy a Green car. As the annual income increased the number of respondents who were ready to buy a Green Car was higher.

The parameter of Annual income of the family was assessed against price willing to pay for a Green Car. Maximum respondents irrespective of their annual income of family prefer to pay Rs. 400000 – 600000.

5. Car Usage:

The parameter of car usage was compared against Green Cars replacing conventional cars over time. Higher number of users whose car usage was leisure agree that Green Cars would replace conventional cars over time.

The parameter of car usage was compared against knowledge about Green Cars. The number of respondents whose usage is for daily commutation agree that they have better understanding of Green Cars.

RECOMMENDATIONS

Based on the analysis, the following recommendations can be implemented:

1. Knowledge about Green Cars: Since many of the respondents were aware about the Green Cars, better communication regarding its usage needs to be given. This will ensure that people will give serious consideration to purchase.
2. Price of Green Cars: In India, only two varieties of Green Car are available. Reva of Mahindra has a price range of Rs. 400000 - 600000 (Ex-Showroom Price) while Prius of Toyota is available in the price range of Rs. 2700000 – 3500000 (Ex-Showroom Price). Since most of the respondents are willing to pay in the price range of Rs. 400000 – 600000, more promotion from Reva regarding its price range is required.
3. Subsidies and Infrastructure: The government should give subsidies on taxation for purchase of green cars, subsidies in toll collection from green car users, and the infrastructure facilities like electronic points at petrol pumps and key areas should be provided by the government at subsidised rates till the demand develops for green cars
4. Promotional Events: Events like test drive tours can be conducted at Corporate parks or areas where corporate parks are located , popular malls etc. Companies can conduct events like Speed , Time Distance Rally where participants can use green cars for the rally.

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