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Consumer's Willingness to Purchase Green Home Appliances in UAE

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Abstract:
Subsequent to UAE's high ranking among countries with high energy consumption per capita, carbon foot print and ecologically wasteful countries, series of green initiatives and campaigns were introduced by various stakeholders to uplift the country's green image. With the country's energy consumption per capita being very high above the global average, many awareness and educational programs were rolled out to rationalize consumption and bring down the per capita consumption levels among the people. Replacing conventional models of home appliances with appliances having energy saving features or green home appliances (GHA) is a definite way to bring down the consumption per capita and save energy. This study explores the consumers awareness, preference and willingness to pay for green hone appliances in the UAE. While there are many studies done on consumer willingness to adopt green products world wide, green home appliances and their role in saving power consumption has not been studied. This study aims to fill this research gap. Data was collected in Dubai from 210 respondents. Stratified convenience sampling was used to represent the multicultural population of Dubai in the sample. Primary data was collected with a questionnaire. The findings reveal that there is fair awareness and preference for GHA among the consumers who are also prepared to pay premium for the green features. The future prospects for GHA looks bright in the country with the legislations on rating appliances based on their energy ansumption being enforced and majority of the consumers expressing interest in GHA.

Keywords: Green home appliances, awareness, preference, WTP, UAE

1. Introduction

1.1. Power consumption Scenario in UAE
UAE's rich reserves of hydrocarbons and lack of early adoption of green practices led to the country taking a back seat in its research and practice of Green Marketing. The country was consistently ranked high among the list of ecologically wasteful countries and among countries with highest emissions per capita. . The UAE is one of the world's major consumer of electricity As of September, 2012, the UAE uses 225% more energy than Europe, and its per capita carbon footprint is four times higher than average worldwide. The country has the highest energy consumption per capita in the world at 20-30 kilowatt hours per day while the global average is 7-15 kilowatt hours per day. According to the Ecological Footprint Initiative, household sector is the main contributor of UAE's ecological footprint at 57% and according to Dubai Electricity and Water Authority the residential sector is the second highest power consuming unit in the country.

1.2. Green Campaigns
The Government took serious measures to uplift the country's green image like that of housing the renewable energy research center, IRENA and establishing the world's model sustainable city with least emission levels – Masdar on its soil. Plans are upfront in developing the nation into a hub of alternative energy and green research. With the launch of key initiatives such as the 'Green Economy for sustainable development', the aim of UAE is to become a world leader in the export and re-export of green products and technologies. The Government has initiated numerous green initiatives, investments, regulations and legislations to boost green sustainability. Strategies such as the Green Economy Initiative, Integrated Energy strategy 2030, Vision 2021, formation of organisations like the Supreme Energy Country, Dubai Carbon Centre of Excellence, ESMA, Green growth follow up office, hosting prestigious green energy forums and instituting awards and prizes like the Zayed Future Energy Prize, Emirates Environmental Award, Emirates Energy Awards are few of the many green initiatives taken by the Government.
There has also been many green campaigns initiated by the utility targeting the consumer promoting reduced power consumption. Through its educational campaigns, awareness building campaigns, smart grid initiatives and various others, the utility - Dubai

Electricity and water authority (Dewa) aims to develop a culture of conservation, build best practices and spread awareness among people.

Apart from the Government and the utility provider, many companies have also joined the green bandwagon advocating rationalized consumption by using energy saving appliances. Companies such as LG, Samsung, Panasonic, Siemens and many others in home appliances product category drive in the idea of saving on utility bills and being a responsible green consumer by using energy efficient products. They also periodically roll out educational and awareness programs on the need and benefits of using green home appliances

1.3. Saving Power by Using Green Home Appliances (GHA)
GHA are home appliances with built in energy saving features. They have technical features which requires lesser energy than a conventional model and are eco-friendly. Appliances more than 10 years old are clunkers as they use up most of the energy. If consumers replace them with energy efficient appliances, it will not only save energy but also reduce carbon emissions significantly. Most of the home appliances have a longer life. Hence its medium to long term benefits should be weighed while making a purchase decision. There are many brands offering green benefits. If the consumers are made aware and willing to make the shift to green appliances, large amount of power could be saved. So over the life of the appliance, customers can make a big difference by choosing green home appliances. Over time the use of home appliances positively impacts household bills and energy footprint.

The table below compares the average power consumption figures between a conventional appliance and an appliance with energy star rating classified as green.

Appliance	Average Power Consumption [1]	Power Saving[2]
Refrigerator*	725 W	15% - 20%
Cloth Washers	350W -500W	20%-50%
Dishwashers	1200 W – 2400 W	25%
Television	100 – 170W	25%
Air Conditioners	1000 W	20% - 50%
Water heaters**	4500W – 5500W	50%
*: frost-free, 16 cubic feet, **: 40 gallon, Source 1: http://energy.gov/energysaver , 2:http://www.nrdc.org/air/energy, http://www.daftlogic.com, https://www.energystar.gov/products/certified-products		

Table 1: Comparison in Power consumption between green and conventional model of home appliances

As Green home appliances have been reported to save power and reduce carbon emissions, different practices, mostly backed by Government intervention are employed in different countries to grade the appliances based on their power consumption requirement. Energy Star labelling is one such practice adopted in the USA. Similar to Energy star labelling, the Emirates Standardisation and Metrology Authority (ESMA) has passed legislation in 2013 for the implementation of the Energy rating system to grade the energy consumption of appliances using a star system, setting thereby a benchmark for energy efficiency. The energy rating, based on a star rating system from one to five, showing the annual consumption of electricity and the level of energy efficiency displayed on labels will help consumers compare models most likely leading to the purchase of energy efficiency appliances. Manufacturers who sell high energy consuming products are charged a fee according to the star rating.

2. Literature Review
While consumer's willingness to purchase green products have been studied worldwide, the term 'green products' was dealt at a very generic level; including organic products, products without toxic elements and eco-friendly products. The energy saving role in specific has not been addressed much. Likewise when consumer and green products have been researched in most countries, meager research has been done in this field in UAE. The few published ones refers to the private research companies being engaged by corporate houses to study specific raise awareness on their specific eco-friendly product range as in case of Siemens (SHC) which engaged Raee Public Relations - Consultancy when it was all set to launch its range of eco-friendly codless phones in 2008. Another research was done by a research and consulting firm Synovate as a part of their Global trends survey (2011), interviewed 22,000 people across 28 countries of which UAE was also a participating country. Respondents were asked about their recycling habits, purchase of organic foods and ecological products. The Abu Dhabi Environmental Agency (EAD) has been conducting environmental awareness and behavior survey across the emirate of Abu Dhabi since 2008 to determine the level of environment awareness. A Survey by Dubai Chamber titled Consumer's Social Responsibility, Sustainable consumption and Green Shopping in the UAE by Dr. Bellaid Rettab and Dr. Anis Ben Brik in 2009 focused on consumer opinion on Green Marketing as a face of Corporate Social Responsibility.

3. Research Gap
With negligible literature available on the consumers understanding of green home appliances and their willingness to purchase them, this study will offer great opportunity to explore this research gap and provide valuable insights to the corporate sector and Government bodies in understanding the actual consumer awareness level and acceptance criteria of Green Home appliances from the

consumer perspective. Hence the Research Gap can be summarized as:The awareness level, preferences and acceptance for the green home appliances has not been studied in UAE

4. Research Questions
Based on the research gap, the following research questions have been formulated.
    i.   What is the level of awareness for green home appliances among the consumers?
    ii. What is the preference for green home appliances among the consumers?
    iii. Whether demographic variables affect consumer willingness to pay for green home appliances?

5. Scope of the Study
The three stakeholders (Government, Utility and Corporate) have introduced various green initiatives and investments to uplift the country's green index. This study will examine if all the initiatives and investments have created any influence at the basic level – the individual. The study will examine if the individual as a consumer has been made aware of the ways he could contribute to reducing power consumption by using green home appliances. GHA refers to major white goods which the consumer uses in his day to day life (like refrigerators, ACs, TVs, Dishwashers, Cloth washers) that cost energy. The study will explore the influence of green campaigns on the consumer in terms of creating awareness, preference and acceptance for GHA

6. Research Problem
It has been established in the literature review:
   •   That per capita power consumption of UAE is much higher than the global average and households are significantly contributing to it.
   •   That Green home appliances save energy substantially in comparison to their conventional models.
But the Consumer willingness to adopt GHA has not been explored in UAE. The core issue of understanding the current awareness, preference and acceptance criteria among the consumers still remains unknown and this research problem has been addressed through this study.

7. Theoretical Framework
Impact of various green campaigns on the consumer in terms of creating awareness of GHA, preference and WTP has been studied using the AIDA Model. AIDA which is an acronym for the Attention or Awareness, Interest, Desire and Action is a model used to assess the impact of marketing communications among the audience. The AIDA Model identifies cognitive stages an individual goes through during the buying process for a product or service
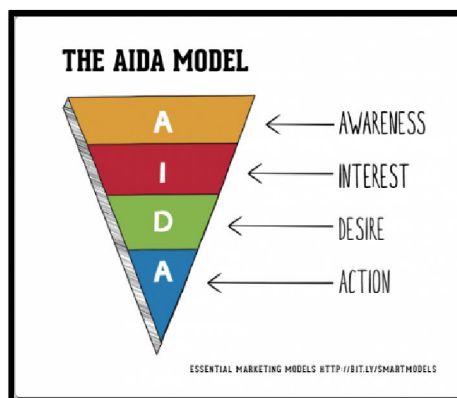

Figure 1: AIDA Model,
Source: Essential marketing models http://bit.ly/smartmodels

Of the many versions of AIDA, the CAB model could be adopted to study the consumer's willingness to purchase green home appliances because of its simplicity and the three tier sequence which coheres to the three criteria addressed in the research objectives – awareness, preference and acceptance (willingness to pay). The CAB model stands for Cognition (Awareness or learning), Affect (feeling, interest or desire) and behavior (action). The effect of the green campaigns assessed with the CAB model, on the consumer purchase decisions of green home appliances is the outline of the study.

8. Research Objectives
    i.   To determine the awareness level of green home appliances among the Consumers
    ii. To determine the preference criteria for green home appliances among the Consumers
    iii. To determine the extent of consumer willingness to pay for green home appliances across demographic variables

9. Research Methodology

9.1. Sample Size: The Sample size for the study has been arrived using Taro Yamane's formula as:

$$n = N / [1 + N (e)^2]$$

Where:

n = sample size, N = population size and e = sampling error assumed as 0.05

Applying Taro Yamane's formulae to derive the sample size for the survey on the Dubai population of 2.1 Million, a sample size of 210 is derived for the survey.

9.2.Sampling Method: Stratified Random Sampling will be used. The Sample will represent strata's of Dubai's population demographics – the national and the expatriate population and a simple random sample will be drawn from each stratum.

9.3. Sampling Unit: The Sample statistics will represent the UAE population demographics as given below:

Dubai Population	Population* Statistics	Sample Statistics
Total	2.1 M	210
UAE Nationals (20%)	0.3 M	40
Expatriate (80%)	1.6 M	170
Asians	1.2 M	89
Expatriate Arabs	0.3 M	56
Others	0.1 M	25

Table 2: Population of Dubai
Source: AME info

9.4. Sampling Area: sampling area was Dubai

9.5. Research Instrument: A structured Questionnaire was adopted as a research instrument to conduct the study. The Questionnaire had five sections focusing on consumer's demographic profile, understanding and awareness on the issue, preference criteria, Consumers WTP for GHA and the future prospects. Questionnaire was administered personally and virtually.

9.5.1. Quality of the Research Instrument
Reliability: The reliability was tested using cronbach alpha method
Cronbach's alpha was calculated using the formula:

$$\alpha = [K/(K-1)] * \left[1 - \left[\frac{Sum\ of\ item\ variances}{(SD)^2} \right] \right]$$

Where, K = number of items = 7
Sum of item Variances computed = 10.9
SD = Standard Deviation = 5.683
Substituting the values in the equation we get:

$$\alpha = [7/(7-1)] * \left[1 - \left[\frac{10.9}{(5.683)^2} \right] \right]$$

Cronbach's alpha = 0.7729

Which implies the variables selected – awareness, preference and WTP fit into the reliability model.

9.5.2. Pilot Testing Questionnaire
The questionnaire was pilot tested with 20 respondents who represent the sample and with a research consultant to evaluate the effectiveness of the instrument and identify anomalies, if any. It was found out that the term 'Green home appliances' generated some confusion among respondents, hence a short explanation - 'home appliances with green features' was provided in brackets. Also annual income multiple choice question was changed to monthly income to suit the convenience of the respondents.

9.5.3. Ethical Considerations
- The participants were informed the aim of the study, permission for time and information was sought and no invasion into their privacy was made during the course of data collection.
- No Pirated software was used to carry out the analysis

9.5.4. Summary of Research Methodology

RO 1	To determine the awareness level of green home appliances among the Consumers
Research Design	Exploratory Research
Observational Design	1. Variable Identification through Literature Review (Understanding on Green issues, Exposure to green campaigns, Perception on Green statements, Familiarity to Green attributes) 2. Questionnaire Preparation 3. Pilot testing Questionnaire
Sampling Design	Stratified proportional sampling (strata based on nationality) Sample size estimated based on Taro Yamane's formula as 210
Data Analysis	Z test for Hypothesis testing, Descriptive Statistics

Table 3: Research Methodology for objective 1

RO 2	To determine the preference criteria for green home appliances among the Consumers
Research Design	Exploratory Research
Observational Design	1. Variable Identification through Literature Review (Utility, Price, Ease of handling, Appearance, Availability) 2. Questionnaire Preparation 3. Pilot testing Questionnaire
Sampling Design	Stratified proportional sampling (strata based on nationality) Sample size estimated based on Taro Yamane's formula as 210
Data Analysis	Z test for Hypothesis testing, Descriptive Statistics

Table 4: Research Methodology for objective 2

RO 3	To determine the extent of consumer willingness to pay for the green home appliances across demographic parameters
Research Design	Exploratory Research
Observational Design	1. Variable Identification through Literature Review (Demographic Variables – Age, Gender, Income, Education, Employment, Nationality) 2. Questionnaire Preparation 3. Pilot testing Questionnaire
Sampling Design	Stratified proportional sampling (strata based on nationality) Sample size estimated based on Taro Yamane's formula as 210
Data Analysis	Two way Anova, Descriptive Statistics

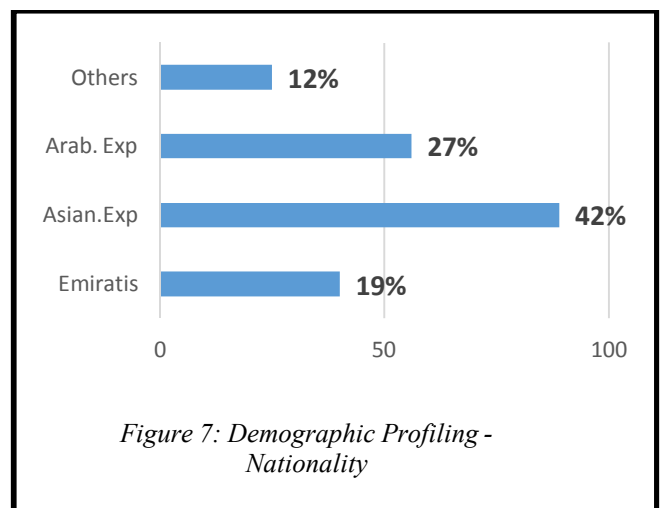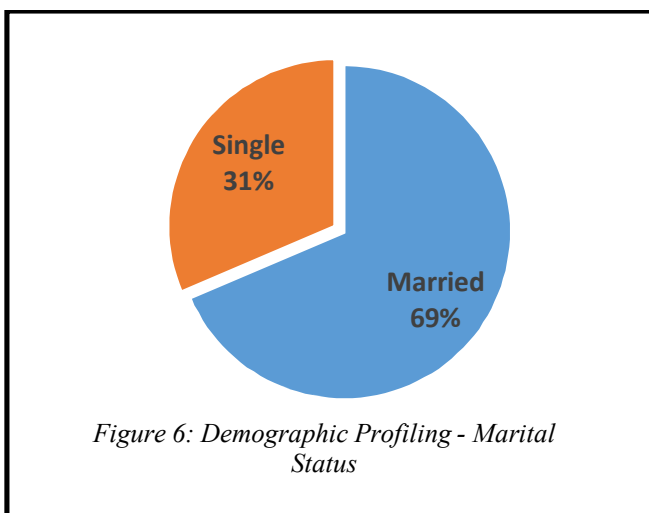*Table 5: Research Methodology for objective 3*

10. Data collection
Data collection was done using two modes – web survey mode using google docs and supervised mode engaging an Arabic – English translator trained at handling the questionnaire specifically for the Arabic (only) speaking portion of the sample. Data collection spanned for 3 weeks in April 2015.

11. Data Analysis and Findings

11.1. Section A: Demographic Profiling
Demographic Profiling was done across gender, age group, education, monthly income, marital status and nationality.
The sample was slightly over represented by male population at 59%. 33% belonged to the 26 yrs to 35 yrs group and 49% were Graduate / diploma holders at 49%. 38% of respondents had monthly income less than 15K AED. 69% were married and 42% were Asian Expatriate population.

Figure 2: Demographic Profiling - Age group

Figure 3: Demographic Profiling - Gender

Figure 4: Demographic Profiling - Educational Qualification

Figure 5 :Demographic Profiling - Income

Figure 6: Demographic Profiling - Marital Status

Figure 7: Demographic Profiling - Nationality
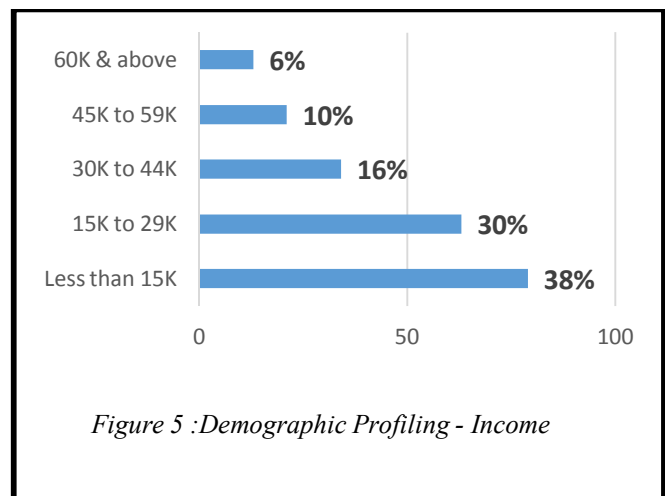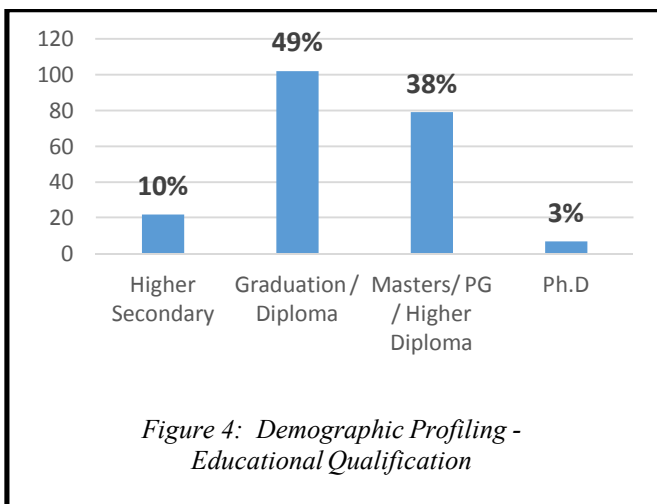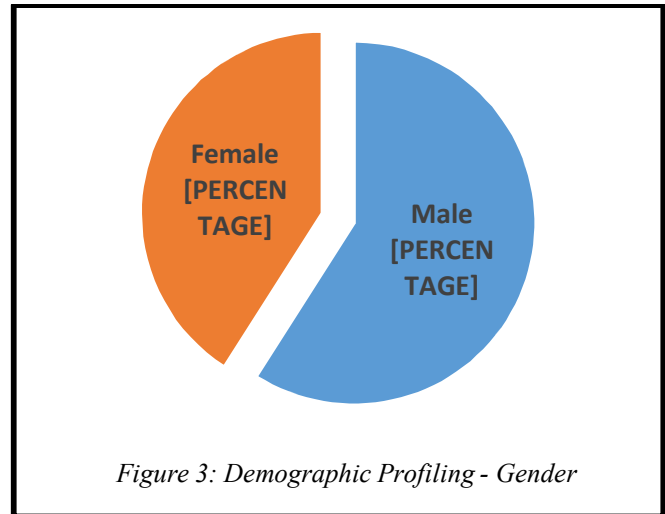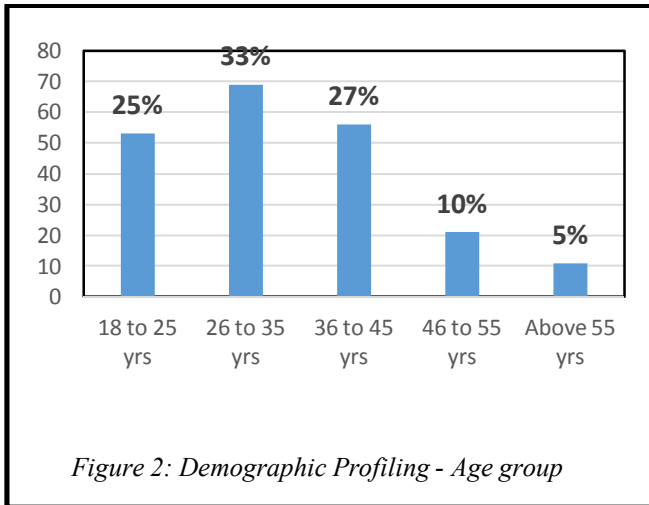
- Environmental concern: 66% of the sample were concerned about Environmental issues (like Energy conservation, Carbon emissions, climatic change, resource scarcity, Global warming). 24% of the sample expressed high concern over the environmental issues while 42% expressed moderate concern.

Figure 8: Concern over Environmental Issues

Figure 9: Level of Concern
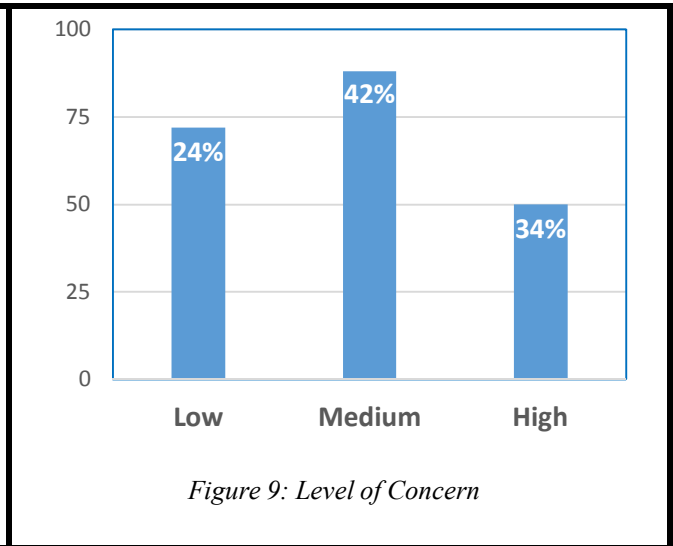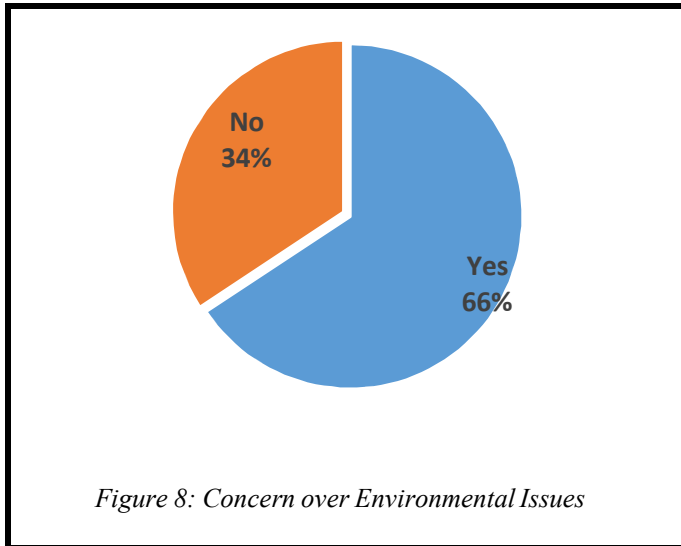
- Recollect Green Campaigns: 61% of the respondents could recollect green campaigns. Of the many green campaigns, DEWA's green campaigns had the highest recall rate of 40%.

Figure 10: Recollect Green Campaigns

Figure 11: Green Campaigns Recollected
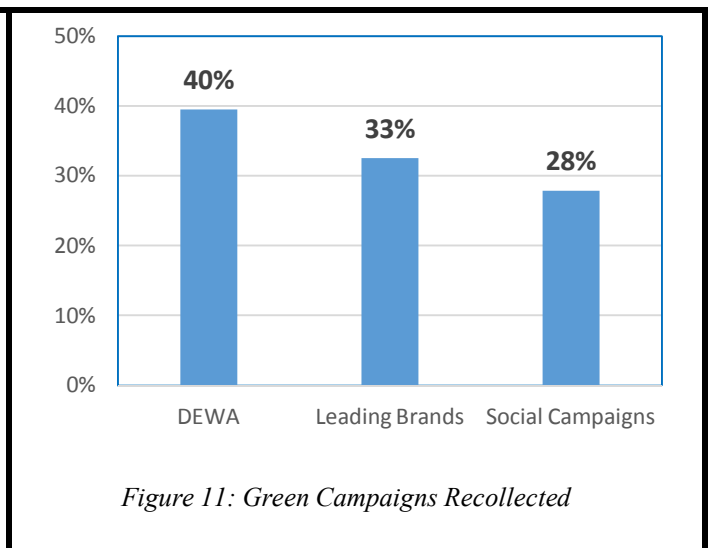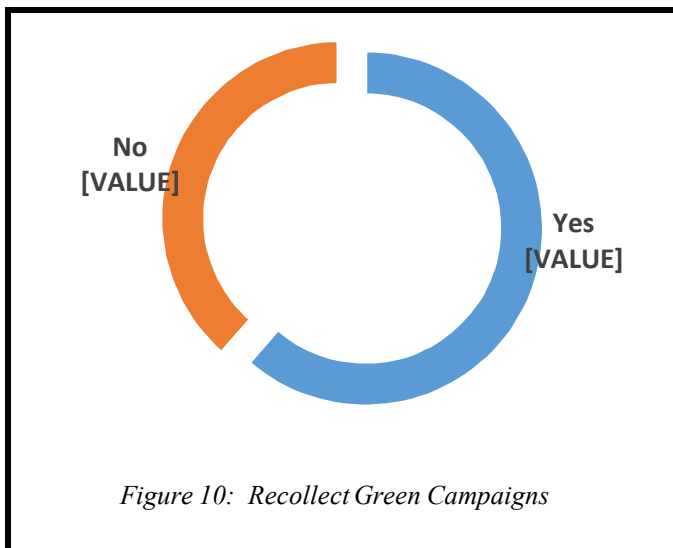
11.2. Section B: Awareness

11.2.1. RO1: To determine the awareness level of GHA among the Consumers

Awareness was assessed using four parameters identified during the literature review which has been addressed detailed in the table below:

Parameter	Assessed by	Type of Question
Exposure	Heard / not about GHA	Dichotomous Question
Understanding	Perception on factual statements on GHA	Three point likert scale with 1 being Agree, 2 being Neutral and 3 being Disagree
Familiarity	Familiar to the green attributes	Dichotomous Question
Recollect	Recollect GHA brands	Open ended Question

Table 6: Awareness

11.2.2. Determining the Level of Awareness

The table below summarizes the positive responses across the four parameters on the basis of which awareness level of the sample was established

Awareness Variables	n	%
Heard about GHA	123	59%
Understanding on GHA	97	46%
Familiarity on green attributes	124	59%
Recollect brands offering GHA	121	58%
Mean Score	**56%**	

Table 7: Determining Awareness level

- Heard about GHA: 59% of the respondents reported to have heard about GHA and the print media (newspaper and magazines) was identified as the first source of information on GHA at 34% followed by internet and social networks at 22%.
- Understanding: Six factual statements were developed based on the literature review to assess the understanding level of the sample. 46% agreed on the factual statements on GHA which implies 46% have right perception on GHA. Among the people who disagreed on the three point likert scale, 25% of the respondents disagreed on the statement - GHA saved money in longer run.
- Familiarity to green attributes: 59% of the respondents were familiar to the green attributes. The least familiarity was reported for ESMA labelling at 30% which might be because it is only gaining momentum now.
- Recollecting GHA brands: 58% of the respondents could recollect brands offering GHA. LG and Panasonic were two brands mentioned most as the brands offering GHA range.

11.2.3. The Awareness Level Was Established as the Mean Score across the Four Parameters at 56%

Demographic variables	n	Heard	Understand	Familiar	Recollect	Avg
Age group						
18 to 25 yrs	53	45%	32%	52%	45%	44%
26 – 35 yrs	69	61%	45%	61%	59%	57%
36 – 45 yrs	56	61%	50%	58%	59%	57%
46 – 55 yrs	21	67%	59%	67%	67%	65%
Above 55 yrs	11	82%	76%	73%	72%	78%
Gender						
Male	124	59%	42%	59%	57%	54%
Female	86	58%	52%	60%	58%	57%
Education						
Hr .Sec	22	14%	0	31%	14%	15%
Grad / Dip	102	46%	36%	55%	45%	46%
Masters / H.Dip / PG	79	84%	69%	69%	82%	76%
Ph.D	7	100%	95%	100%	100%	99%
Monthly Income						
Less than 15K AED	79	49%	35%	56%	48%	47%
15K – 29K AED	63	63%	49%	58%	63%	58%
30K – 44K AED	34	71%	58%	64%	67%	65%
45K – 59K AED	21	48%	44%	59%	48%	50%
60K AED & above	13	77%	71%	71%	77%	74%
Marital Status						
Single	66	53%	39%	56%	52%	50%
Married	144	61%	50%	60%	60%	58%
Nationality						
Arab Expats	56	50%	42%	57%	50%	50%
Asian Expats	89	66%	50%	58%	64%	60%
Emiratis	40	50%	38%	61%	50%	50%
Others	25	64%	57%	63%	64%	62%

Table 8: Awareness across Demographic Variables

Across demographic variables, awareness level was found
- ➢ Increasing from lower to higher age group. It was lowest at 44% in the *18 – 25 yrs* group while it was highest at 78% in the *above 55 years* group.
- ➢ Awareness level was almost same across the genders with *females* at 57%, slightly above the *males* which was at 54%.
- ➢ Education, as expected, had a direct relationship with awareness level – the higher the education, the higher the awareness level. While the awareness level was only 15% among *higher secondary* educated portion of the sample, it was almost 100% among *Ph.D holders*.
- ➢ Awareness level was observed to be highest among the highest monthly income bracket (*60K AED and above*), followed by the *30K to 44K AED* group at 65%. Awareness level was found to be lowest in the *less than 15K AED* group at 47%.
- ➢ Awareness level among *married* people was found to be better than *singles*, at 58%.
- ➢ Among Nationality, the *Asian Expatriates* and '*Others'* (westerners & other countries) better than the *Emirati* and *Arab Expatriates*. The awareness level among the former group was over 60% while among the latter two groups was only 50%.

11.3. Section C: Preference

11.3.1. RO2: To determine the preference for GHA among the Consumers
Preference for GHA was assessed using the following two parameters listed below:
- Liking / look for green features while buying Home appliances
- Regard Power saving as 'most important' feature

The table below summarizes the positive responses across the two parameters on the basis of which preference for GHA of the sample was established

Preference Variables	n	%
Look for green features	121	58%
Power saving feature – most important	91	43%
Mean Score	**51%**	

Table 9: Determining Preference Level

- Look for: 58% of the respondents stated that they "look for" green features while buying home appliances. Among respondents who reported that they don't look for green features, the main reason stated by 31% of the respondents was 'being expensive'.
- Power saving - most important: 43% of the respondents reported that power saving feature is the most important feature they look for in the category
  - ➢ The preference level was established as the mean score across the two parameters at 51%
  - ➢ Attribute rating: The preference rating of product attributes on a three point likert scale showed that Price was rated by 71% of the respondents as 'most important' criteria followed by Durability at 60% and features and utility at 58%. 44% of the respondents considered 'appearance' to be the least important feature while making a home appliance purchase.
  - ➢ Preferred brands: LG and Panasonic brands was mentioned by most of the respondents when asked to mention the brands offering GHA in the market.
  - ➢ Preference across Product categories: When asked to rank the importance of green features across the five product categories on a five point Likert scale, the order of preference of green features was found to be (from most to least): Air conditioners, refrigerators, washing machines, dishwashers and televisions.

Demographic variables	n	Look for	Power saving – Most Important	Avg
Age group				
18 to 25 yrs	53	45%	36%	41%
26 – 35 yrs	69	59%	35%	47%
36 – 45 yrs	56	59%	57%	58%
46 – 55 yrs	21	67%	43%	55%
Above 55 yrs	11	82%	64%	73%
Gender				
Male	124	57%	45%	51%
Female	86	58%	41%	49%
Education				
Hr .Sec	22	14%	18%	16%

Grad / Dip	102	45%	43%	44%
Masters / H.Dip / PG	79	82%	48%	65%
Ph.D	7	100%	71%	86%
Monthly Income				
Less than 15K AED	79	48%	43%	46%
15K – 29K AED	63	63%	44%	54%
30K – 44K AED	34	68%	44%	56%
45K – 59K AED	21	48%	29%	38%
60K AED & above	13	77%	62%	69%
Marital Status				
Single	66	52%	35%	55%
Married	144	60%	47%	54%
Nationality				
Arab Expats	56	50%	25%	38%
Asian Expats	89	64%	61%	62%
Emiratis	40	50%	15%	33%
Others	25	64%	68%	66%

Table 10: Preference across Demographic variables

Across Demographic variables respondents, the preference level was established as follows:
➢ The oldest age bracket of *'above 55 years'* was found to prefer GHA more than others while the youngest age bracket (*18 – 25 yrs*) reported the lowest preference level.
➢ Among Gender classification, *male* were found to prefer GHA by 51%, slightly more than *females* at 49%.
➢ Like awareness, preference also improved along with education level. *Higher Secondary* educated portion of the sample reported the lowest preference for GHA at an alarming 16% while it improved to 86% among *Ph.D holders*.
➢ Preference was observed higher in the highest monthly income bracket of *'Above 60K'* AED' by 69% while it was found lowest in the *'less than 15K'* income bracket at 46%.
➢ Preference was observed to be almost same irrespective of the marital status with just a 1% difference between *Singles* (55%) and *married* (54%).
➢ Among nationality, the '*Others*' category reported the highest preference at 66% closely followed by the *Asian Expatriates* at 62%. The *Emiratis* registered the lowest preference for GHA at 33%, closely followed by the *Arab Expatriates* at 38%.

11.4. Section D: Willingness to Pay (Premium)

11.4.1. RO3: To determine the extent of consumer's willingness to pay for GHA across demographic variables
Extent for consumer's willingness to pay was assessed by the following two parameters
• Willingness to pay
• Extent of premium willing to pay
Only 46% of the respondents stated they were willing to pay premium for GHA. The demographic characteristics of this section of the sample are summarized in the table below

Demographic variables	n	WTP	Less than 5%	5% to 10%	Above 10%
Age group					
18 to 25 yrs	53	30%	38%	38%	25
26 – 35 yrs	69	49%	38%	41%	21%
36 – 45 yrs	56	52%	52%	24%	24%
46 – 55 yrs	21	38%	50%	25%	25%
Above 55 yrs	11	82%	33%	67%	0
Gender					
Male	124	44%	42%	35%	24%
Female	86	48%	44%	39%	17%
Education					

Hr .Sec	22	14%	33%	67%	0
Grad / Dip	102	34%	51%	31%	17%
Masters / H.Dip / PG	79	66%	37%	40%	23%
Ph.D	7	86%	50%	17%	33%
Monthly Income					
Less than 15K AED	79	33%	46%	31%	23%
15K – 29K AED	63	56%	46%	29%	26%
30K – 44K AED	34	56%	47%	42%	11%
45K – 59K AED	21	48%	20%	70%	10%
60K AED & above	13	46%	33%	33%	33%
Marital Status					
Single	66	42%	36%	32%	32%
Married	144	47%	46%	38%	16%
Nationality					
Arab Expats	56	34%	37%	32%	32%
Asian Expats	89	54%	46%	35%	19%
Emiratis	40	43%	29%	53%	18%
Others	25	48%	58%	25%	17%

Table 11: WTP across Demographic variables

Extent of willingness to pay was assessed across demographic variables and findings are as follows:

- WTP was observed highest in the *Above 55* age group at 82% and 67% in this group reported to be willing to pay up to 10% premium for the green features.
- WTP differed by a narrow range between the male and female. WTP was observed more among females at 48% and males at 44%. Irrespective of the Gender, both of them opted the *less than 5%* premium range as their choice.
- WTP was found to increase as the education level increased and highest WTP was observed among the Ph.D holders at 86% of which 50% were willing to pay to the extent of (up to) 5%. The least WTP was observed among the higher secondary qualifieds with just 14%.
- WTP was found more in the monthly income bracket of 15K – 44K AED at 56%, of which 47% of the respondents were willing to pay upto 5% premium. WTP was found least among the lowest income bracket of less than 15K AED at 33%
- WTP was found more among married portion of the sample at 47% compared to the singles while both the groups opted the less than 5% premium add up as the extent of their willingness to pay
- Asian expatriates exhibited the highest WTP at 54% and the least was observed among the Arab expats at 34%. Among the 43% of the Emiratis who exhibited WTP, it was observed that 53% were willing to pay to an extent of 10% more for the green features.
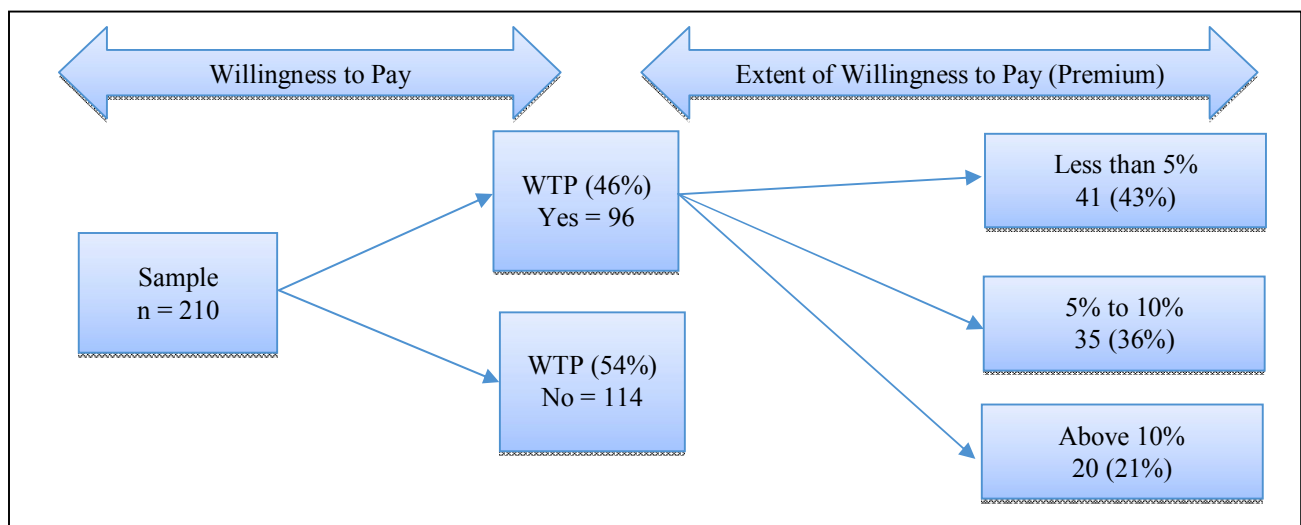

Figure 12: WTP and Extent of willingness to pay premium

11.5. Relationship between the Three Factors

Awareness, Preference and WTP exhibited a positive relationship as observed during the literature review. The correlation matrix has been presented below to substantiate the claim.

VARIABLES	AWARENESS	PREFERENCE	WTP
AWARENESS	1		
PREFERENCE	0.695552022	1	
WTP	0.673481258	0.549476285	1

Table 12: Correlation Matrix

From the table, it can be observed that all the 3 **r values** are positive and hence the positive relationship among the three variables could be confirmed.

12. Research Hypothesis and testing

12.1. Research Hypothesis
- Hypothesis 1: H_o: Consumers are not aware of GHA
  H_a: Consumers are aware of GHA
- Hypothesis 2: H_o: Consumers do not prefer GHA
  H_a: Consumers prefer GHA
- Hypothesis 3: H_o: Demographic variables do not affect consumer's willingness to pay (Premium)
  H_a: Demographic variables affect consumer's willingness to pay (Premium)

12.2. Hypothesis Testing
Hypothesis 1 and 2 were tested using Z –test. Descriptive Statistics and z test statistic of consumer response data is presented for awareness and preference in the table below

Descriptive Statistics	Awareness	Preference
Mean	6.8905	1.0095
Standard Error	0.3295	0.0518
Standard Deviation	4.7756	0.7513
Sample Variance	22.8061	0.5645
Kurtosis	-1.6592	-1.2204
Skewness	-0.1005	-0.0156
Sum	1447	212
Count	210	210
Z test (p value)	**0.51**	**0.42**

Table 13: Hypothesis (1& 2) Testing

The Z test gives a p value greater than 0.05 for both the cases. As $p > 0.05$, the two alternate hypothesis H_a are accepted and can be established that consumers are aware of GHA and prefer GHA. Besides the study finding reveal 56% awareness level and 51% Preference for GHA which strongly supplements our alternate hypothesis 1 & 2,
Hypothesis 3: Demographic variables do affect the extent of consumers willingness to pay (Premium) for GHA

12.2.1. Age vs. Extent of Consumer's willingness to pay (premium)
- H_o: Age does not affect extent of Consumer's willingness to pay (premium)
- H_a: Age affects the extent of Consumer's willingness to pay (premium)

Percent	18 to 25 yrs	26 to 35 yrs	36 to 45 yrs	46 to 55 yrs	Above 55 yrs
Less than 5%	6	13	15	4	3
5% to 10%	6	14	7	2	6
Above 10%	4	7	7	2	0

Table 14: Sample Distribution across Age groups

SUMMARY	Count	Sum	Average	Variance
Less than 5%	5	41	8.2	29.7
5% to 10%	5	35	7	19
Above 10%	5	20	4	9.5
18 to 25 yrs	3	16	5.3333	1.3333
26 to 35 yrs	3	34	11.3333	14.3333
36 to 45 yrs	3	29	9.6667	21.3333
46 to 55 yrs	3	8	2.6667	1.3333
Above 55 yrs	3	9	3	9

Table 15: Statistics Summary

Source of Variation	SS	Df	MS	F	P-value	F crit
Premium Percent	46.8	2	23.4	3.911	0.0654	4.45897
Age	184.933	4	46.233	7.727	0.0077	3.8378
Error	47.866	8	5.983			
Total	279.6	14				

Table 16: ANOVA – Two factor

- ❖ Observation: From the table it can be noticed that:
- Premium Percentage *F value (3.911) < F Critical (4.459), P-value (0.06) > 0.05* which implies the sample does not exhibit statistically significant difference across percent variations
- Age   F Value (7.727) > F Critical (3.838), P-value (0.007) < 0.05 which confirms statistically significant difference across the varying age group of the sample
- ❖ Conclusion: Ho is rejected. Age does seem to affect the extent of consumer's willingness to pay (premium).

12.2.2. Income vs. Extent of Consumer's willingness to pay (premium)

- ➢ H_o: Income level does not affect extent of Consumer's willingness to pay (premium)
- ➢ H_a: Income level affects the extent of Consumer's willingness to pay (premium)

Percent	Less than15K	15K to 29K	30K to 44K	45K to 59K	Above 60K
Less than 5%	12	16	9	2	2
5% to 10%	8	10	8	7	2
Above 10%	6	9	2	1	2

Table 17: Sample distribution across Income group

SUMMARY	Count	Sum	Average	Variance
Less than 5%	5	41	8.2	38.2
5% to 10%	5	35	7	9
Above 10%	5	20	4	11.5
Less than 15K	3	26	8.6667	9.3333
15K – 29K	3	35	11.6667	14.3333
30K – 44K	3	19	6.3333	14.3333
45K – 59K	3	10	3.3333	10.3333
60K & above	3	6	2	0

Table 18: Statistics Summary

Source of Variation	SS	df	MS	F	P-value	F crit
Premium Percent	46.8	2	23.4	3.754	0.0708	4.4589
Income	184.933	4	46.233	7.417	0.0084	3.8378
Error	49.866	8	6.233			
Total	281.6	14				

Table 19: ANOVA - Two Factor

- ❖ Observation: From the table it can be noticed that:

- Premium Percentage (Rows) *F value (3.754) < F Critical (4.459), P-value (0.07) > 0.05* which implies the sample does not exhibit statistically significant difference across percent variations
- Income F Value (7.417) > F Critical (3.838), P-value (0.008) < 0.05 which confirms statistically significant difference across varying income group of the sample
- ❖ Conclusion: Ho is rejected. Income does seem to affect the extent of consumer's willingness to pay (premium).

12.2.3. Education vs. Extent of Consumer's willingness to pay (premium)
- ➢ H_o: Education does not affect extent of Consumer's willingness to pay (premium)
- ➢ H_a: Education affects the extent of Consumer's willingness to pay (premium)

Percent	Higher Sec	Grad / Dip	Masters	Ph.D
Less than 5%	1	18	19	3
5% to 10%	2	11	21	1
Above 10%	0	6	12	2

Table 20: Sample Distribution across Education levels

SUMMARY	Count	Sum	Average	Variance
Less than 5%	4	41	10.25	91.5833
5% to 10%	4	35	8.75	86.9167
Above 10%	4	20	5	28
Higher Sec	3	3	1	1
Grad / Dip	3	35	11.6667	36.3333
Masters	3	52	17.3333	22.3333
Ph.D	3	6	2	1

Table 21: Statistics Summary

Source of Variation	SS	df	MS	F	P-value	F crit
Premium Percent	58.5	2	29.25	2.7931	0.1389	5.1433
Education	556.6667	3	185.5556	17.7188	0.0022	4.7571
Error	62.8333	6	10.4722			
Total	678	11				

Table 22: ANOVA - Two Factor

- ❖ Observation: From the table it can be noticed that:
- Premium Percentage *F value (2.793) < F Critical (5.143), P-value (0.138) > 0.05* which implies the sample does not exhibit statistically significant difference across percent variations
- Education F Value (17.718) > F Critical (4.757), P-value (0.002) < 0.05 which confirms statistically significant difference across the groups with different educational levels.
- ❖ Conclusion: Ho is rejected. Education does seem to affect the extent of consumer's willingness to pay (premium).

12.2.4. Nationality vs. Extent of Consumer's willingness to pay (premium)
- ➢ H_o: Nationality does not affect extent of Consumer's willingness to pay (premium)
- ➢ H_a: Nationality affects the extent of Consumer's willingness to pay (premium)

Percent	Arab Expats	Asian Expats	Emiratis	Others
Less than 5%	7	22	5	7
5% to 10%	6	17	9	3
Above 10%	6	9	3	2

Table 23: Sample Distribution across Nationality

SUMMARY	Count	Sum	Average	Variance
Less than 5%	4	41	10.25	62.25
5% to 10%	4	35	8.75	36.25
Above 10%	4	20	5	10
Arab Expats	3	19	6.3333	0.3333
Asian Expats	3	48	16	43
Emirati	3	17	5.6667	9.3333
Others	3	12	4	7

Table 24: Statistics Summary

Source of Variation	SS	df	MS	F	P-value	F crit
Premium Percent	58.5	2	29.25	2.8849	0.1325	5.1432
Nationality	264.6667	3	88.2222	8.7014	0.0133	4.7571
Error	60.8333	6	10.1389			
Total	384	11				

Table 25: ANOVA - Two Factor

❖ Observation: From the table it can be noticed that:
- Premium Percentage *F value (2.884) < F Critical (5.143)*, *P-value (0.132) > 0.05* which implies the sample does not exhibit statistically significant difference across percent variations
- Nationality F Value (8.701) > F Critical (4.757), P-value (0.013) < 0.05 which confirms statistically significant difference across the nationality groups.
❖ Conclusion: Ho is rejected. Nationality does seem to affect the extent of consumer's willingness to pay (premium).

12.2.5. Marital Status vs. Extent of Consumer's willingness to pay (premium)
➢ H$_o$: Marital Status does not affect extent of Consumer's willingness to pay (premium)
➢ H$_a$: Marital Status affects the extent of Consumer's willingness to pay (premium)

Percent	Married	Single
Less than 5%	31	10
5% to 10%	26	9
Above 10%	11	9

Table 26: Sample Distribution across marital status

SUMMARY	Count	Sum	Average	Variance
Less than 5%	2	41	20.5	220.5
5% to 10%	2	35	17.5	144.5
Above 10%	2	20	10	2
Married	3	68	22.6667	108.3333
Single	3	28	9.3333	0.3333

Table 27: Statistics Summary

Source of Variation	SS	Df	MS	F	P-value	F crit
Premium Percent	117	2	58.5	1.1662	0.4616	19
Marital Status	266.6667	1	266.6667	5.3156	0.1476	18.5128
Error	100.3333	2	50.1667			
Total	484	5				

Table 28: ANOVA - Two Factor

❖ Observation: From the table it can be noticed that:
- Premium Percentage *F value (1.166) < F Critical (19)*, *P-value (0.461) > 0.05* which implies the sample does not exhibit statistically significant difference across percent variations
- Marital Status   F Value (5.315) < F Critical (18.512), P-value (0.147) > 0.05 which the sample does not exhibit statistically significant difference across varying marital status
❖ Conclusion: Failed to reject H$_0$. Marital Status does not seem to affect the extent of consumer's willingness to pay (premium)

12.2.6. Gender vs. Extent of Consumer's willingness to pay (premium)
- ➤ H$_o$: Gender does not affect extent of Consumer's willingness to pay (premium)
- ➤ H$_a$: Gender affects the extent of Consumer's willingness to pay (premium)

Percent	Female	Male
Less than 5%	18	23
5% to 10%	16	19
Above 10%	7	13

Table 29: Sample Distribution across Gender

SUMMARY	Count	Sum	Average	Variance
Less than 5%	2	41	20.5	12.5
5% to 10%	2	35	17.5	4.5
Above 10%	2	20	10	18
Female	3	41	13.6667	34.3333
Male	3	55	18.3333	25.3333

Table 30: Statistics Summary

Source of Variation	SS	Df	MS	F	P-value	F crit
Premium Percent	117	2	58.5	50.1429	0.0196	19
Gender	32.6667	1	32.6667	28	0.0339	18.5128
Error	2.3333	2	1.1667			
Total	152	5				

Table 31: ANOVA - Two Factor

- ❖ Observation: From the table it can be noticed that:
- • Premium Percentage F value (50.142) > F Critical (19), P-value (0.019) < 0.05 which implies the sample does exhibit statistically significant difference across percent variations
- • Gender F Value (28) > F Critical (18.512), P-value (0.033) < 0.05 which implies the sample exhibits statistically significant difference across Gender variations
- ❖ Conclusion: Ho is rejected. Gender does seem to affect extent of consumer's willingness to pay (premium).

13. Section E: Future Prospects
- • When asked whether enough information was available on GHA, 49% replied affirmatively.
- • 26% of the respondents remarked that the green campaigns have made them more knowledgeable while 22% remarked that these campaigns have prompted them to seek more information on GHA
- • On their intention to buy GHA in their next purchase, 68% replied positively while 29% were undecided as they chose to respond 'may be' and only 3% said 'No'
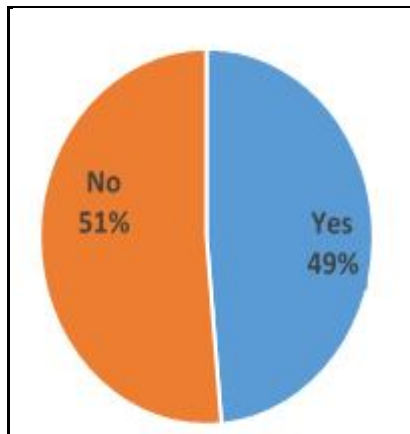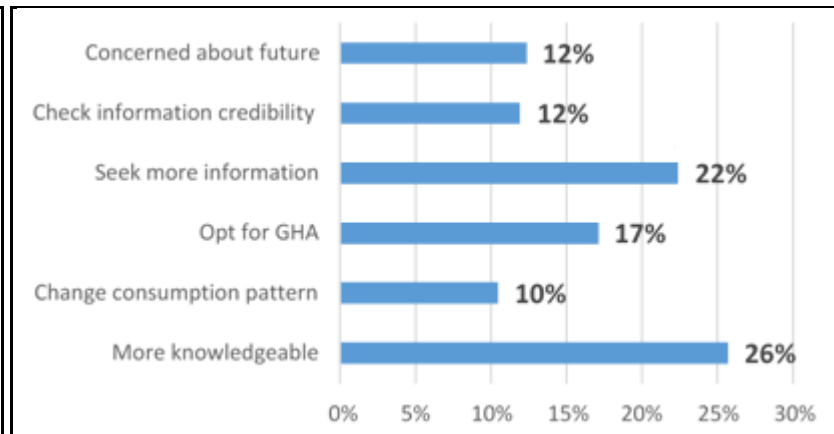

Figure 13: Enough Information Available

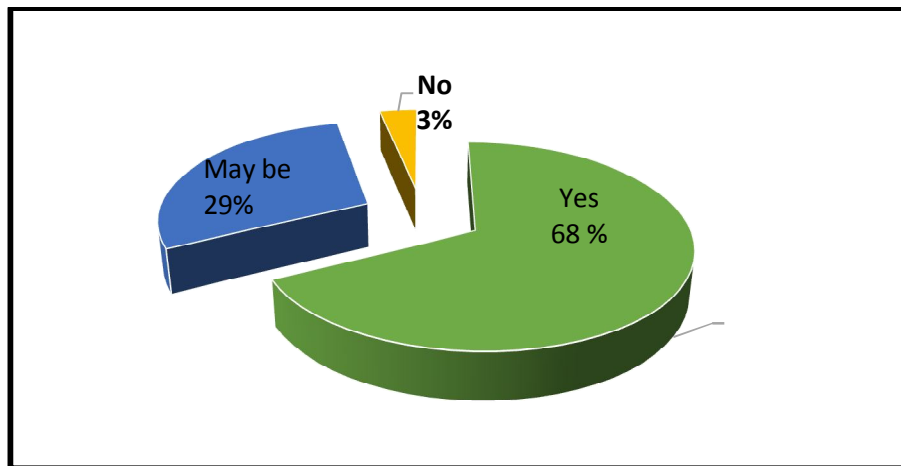*Figure 14: These Information made me..*

Figure 15: Prospects of GHA purchase in future

13.1. Suggestions

During the course of the survey respondents were asked to suggest ideas to make GHA more appealing. The following were some of the valuable suggestions obtained:

- Government Intervention :
  - ➢ Establish regulations for green claims.
  - ➢ Conformity body to assess the proof of green claims Suggestions
  - ➢ To overlook and restrict / ban the availability of high power consuming models in the market
  - ➢ Rating bodies to compulsorily rate the HA, display the rating and create awareness among the public
- Pricing :
  - ➢ Offer GHA at par with conventional models
  - ➢ Give discounts / rewards on GHA purchase
- Product :
  - ➢ Make power saving an inherent product feature available at no extra cost
  - ➢ Mark the power saving ability on the product itself so as it garners more attention
- Retailing :
  - ➢ Retail outlets should compulsorily gave green stalls / corners displaying only GHA range of products
  - ➢ Retail outlets should display the benefits of using GHA at POS
  - ➢ The Shop sales staff should be trained to promote GHA and make people aware of the benefits
  - ➢ GHA should be made as easily available as conventional models
- Promotions :
  - ➢ More advertisements on media about GHA
  - ➢ Awareness drive to promote the use of GHA
  - ➢ Guaranty / Warranty to be provided only for GHA
- Utility
  - ➢ Utility bills to carry information / advertisements on GHA
  - ➢ Link household power consumption to source on utility bills and give breakdown power consumption

14. Summation of Results

The results of the study could be summed up as follows

Demographic variables	n	Awareness	Preference	WTP	Extent
Age group					
18 yrs to 25yrs	53	44%	41%	30%	>5% (38%) 5%-10% (38%)
26 yrs – 35 yrs	69	57%	47%	49%	5%-10% (41%)
36 yrs – 45 yrs	56	57%	58%	52%	>5% (52%)
46 yrs – 55 yrs	21	65%	55%	38%	>5% (50%)
Above 55 yrs	11	78%	73%	82%	5%-10% (67%)
Gender					
Male	124	54%	51%	44%	>5% (42%)
Female	86	57%	49%	48%	>5% (44%)
Education					

Hr .Sec	22	15%	16%	14%	5%-10% (67%)
Grad / Dip	102	46%	44%	34%	>5% (51%)
Masters / H.Dip / PG	79	76%	65%	66%	5%-10% (40%)
Ph.D	7	99%	86%	86%	>5% (50%)
Monthly Income					
Less than 15K AED	79	47%	46%	33%	>5% (46%)
15K – 29K AED	63	58%	54%	56%	>5% (46%)
30K – 44K AED	34	65%	56%	56%	>5% (47%)
45K – 59K AED	21	50%	38%	48%	>5% (70%)
Above 60K AED	13	74%	69%	46%	33% for each
Marital Status					
Single	66	50%	43%	42%	>5% (36%)
Married	144	58%	54%	47%	>5% (46%)
Nationality					
Arab Expats	56	50%	38%	34%	>5% (37%)
Asian Expats	89	60%	62%	54%	>5% (46%)
Emiratis	40	50%	33%	43%	5%-10% (53%)
Others	25	62%	66%	48%	>5% (58%)

Table 32: Awareness, Preference and WTP across Demographic variables

Awareness	**56%**
Preference	**51%**
WTP, Extent	**46%, Less than 5% (43%)**

Table 33: Findings Summary

15. Discussion and Conclusion:
The Research objectives to determine the awareness level, preference and extent of WTP was met and the levels were established at 56%, 51% and 'less than 5%' as the extent of premium willing to be paid on GHA.
Environment Concern was found higher at 66% in the sample and the green campaigns initiated by the three stake holders (Government, Utility and Corporates) have garnered attention among the public as 61% of the sample were able to recollect some green campaign.
Awareness, preference and WTP was lower among the lower age groups, lower income group and lower educated group. While the awareness level was almost same across gender, preference was noted slightly higher among male. While Awareness and Preference was found lower among the Emirati and Arab portion of the sample, WTP was observed more among the Emiratis and lower among the Arab Expatriates.
There is bright prospects for GHA with Government regulations coming into force, rating bodies in the process of rating and standardizing the appliances and 68% reporting they would opt for GHA in their next purchase. By targeting the awareness campaigns at the group which has reported lower levels of awareness, the prospects could be improved further and more people could be made aware resulting in significant saving in power, money and reduction in carbon emissions at household level and helping the nation to uplift its green index.

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